PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-311449
(43)Date of publication of application : 23.10.2002

(51)Int.Cl. G02F 1/1343
G02F 1/1335
G02F 1/13357
G09F 9/00
G09F 9/30
G09F 9/35

(21)Application number : 2001-357706
(22)Date of filing : 22.11.2001

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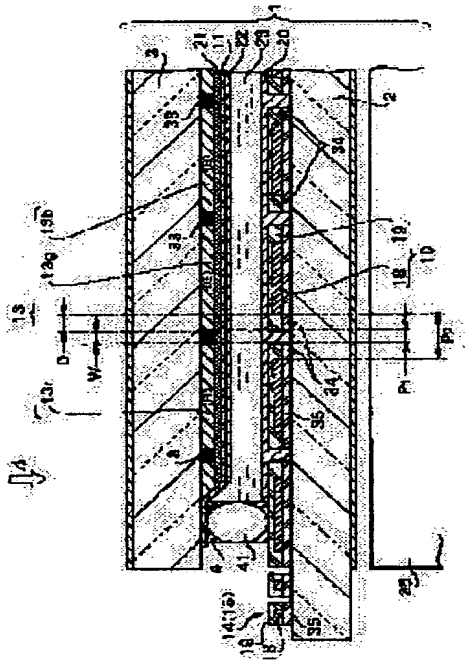
(30)Priority
Priority number : 2001029747 Priority date : 06.02.2001 Priority country : JP

(54) LIQUID CRYSTAL DEVICE, MANUFACTURING METHOD OF LIQUID CRYSTAL DEVICE, AND ELECTRONIC EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent the occurrence of dispersion in a quality level of display of a liquid crystal panel by suppressing dispersion of area ratio between a light transmission area and a light reflex area even when deviation in position of a semi-transmission reflective film is caused.
SOLUTION: The liquid crystal device 1 is constituted by arranging a liquid crystal 23 between a first substrate 2 and a second substrate 3. The liquid crystal device 1 is provided with a reflective conductive film 18 formed on the first substrate 2, a translucent metal oxide film 19 to be laminated on the reflective conductive film 18 and the edge part 34 of which is brought into contact with a ground film 35 or the first substrate 2 and an illuminator 25 to irradiate the liquid crystal 23 with light from the outside of the first substrate 2. Since the edge part 34 around the reflective conductive film 18 exists, no change occurs in area of a light reflex region to contribute to reflection even when the position of the reflex conductive film 18 is deviated in the horizontal direction.



LEGAL STATUS

[Date of request for examination] 22.11.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The liquid-crystal equipment characterized by to have the metallic-oxide film of a translucency with which an edge portion contacts the 1st substrate of the above, and a lighting means irradiate light towards the aforementioned liquid crystal from the outside of the 1st substrate of the above in the liquid-crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate while a laminating is carried out on the reflection nature electric-conduction film formed in the 1st substrate of the above, and this reflection nature electric-conduction film.
[Claim 2] Liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate which are characterized by providing the following. The ground film prepared in the 1st substrate of the above. The reflection nature electric conduction film formed on this ground film. The metallic-oxide film of a translucency with which an edge portion contacts the aforementioned ground film while a laminating is carried out on this reflection nature electric conduction film. A lighting means to irradiate light towards the aforementioned liquid crystal from the outside of the 1st substrate of the above.
[Claim 3] The aforementioned edge portion which contacts the 1st substrate of the above in a claim 1 is liquid crystal equipment characterized by constituting the light-transmission section within one display dot in the liquid crystal display of a transflective reflective method.
[Claim 4] The aforementioned edge portion which contacts the aforementioned ground film in a claim 2 is liquid crystal equipment characterized by constituting the light-transmission section within one display dot kicked to the liquid crystal display of a transflective reflective method.
[Claim 5] It is liquid crystal equipment characterized by the aforementioned ground film containing a metallic oxide in a claim 2.
[Claim 6] Liquid crystal equipment characterized by having the reflecting layer which reflects the light of a blue component in the upper surface of the aforementioned reflection nature electric conduction film in a claim 1 or a claim 2.
[Claim 7] It is liquid crystal equipment characterized by constituting the 1st electrode for the aforementioned reflection nature electric conduction film and the aforementioned metallic-oxide film impressing voltage to the aforementioned liquid crystal in a claim 1 or a claim 2.
[Claim 8] Liquid crystal equipment characterized by having the coloring layer prepared corresponding to the intersection field of the 2nd electrode which countered the 1st electrode of the above and was formed on the 2nd substrate of the above in the claim 7, and the 1st electrode of the above and the 2nd electrode of the above.
[Claim 9] It is liquid crystal equipment characterized by being the stripe-like electrode from which the 1st electrode of the above constitutes the liquid crystal equipment of a passive matrix in a claim 7 or a claim 8.
[Claim 10] It is liquid crystal equipment characterized by being the dot-like electrode from which the 1st electrode of the above constitutes the liquid crystal equipment of an active matrix in a claim 7 or a claim 8.
[Claim 11] It is the claim 7 which is equipped with the following, and a viewing area is formed of the meeting of the intersection field of the 1st electrode of the above, and the 2nd electrode of the above, and the wiring which leads to the wiring and the 2nd electrode of the above which are connected with the 1st electrode of the above exists in the outside of the aforementioned viewing area, and at least one side of the aforementioned wiring is formed of a metallic oxide, and is carried out [that a reflection nature electric conduction The 2nd electrode which countered the 1st electrode of the above and was formed on the 2nd substrate of the above. Wiring which leads to the 1st electrode of the above. Wiring which leads to the 2nd electrode of the above.
[Claim 12] It is liquid crystal equipment characterized by being the alloy with which the aforementioned reflection nature electric conduction film contains a silver simple substance or silver in a claim 1 or a claim 2.
[Claim 13] It is liquid crystal equipment characterized by the aforementioned metallic-oxide film being ITO (Indium Tin Oxide) in a claim 1 or a claim 2.
[Claim 14] The area of the aforementioned edge portion which contacts the 1st substrate of the above in a claim 1 is liquid crystal equipment characterized by being [of the area of 1 display dot to which this edge portion belongs] 30 - 50% desirably 10 to 70%.
[Claim 15] The area of the aforementioned edge portion which contacts the aforementioned ground film in a claim 2 is liquid crystal equipment characterized by being [of the area of 1 display dot to which this edge portion belongs] 30 - 50% desirably 10 to 70%.
[Claim 16] The manufacture method of the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate which are characterized by providing the following. The process which forms a reflection nature electric conduction film on the 1st substrate of the above. The process which forms the metallic-oxide film of a translucency on the aforementioned reflection nature electric conduction film so that an edge portion may contact the 1st substrate of the above. The process which prepares a lighting means to irradiate light in the outside of the 1st substrate of the above.
[Claim 17] The manufacture method of the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate which are characterized by providing the following. The process which forms a ground film on the 1st substrate of the above. The process which forms a reflection nature electric conduction film on this ground film. The process which forms the metallic-oxide film of a translucency on the aforementioned reflection nature electric conduction film so that an edge portion may contact the aforementioned ground film. The process which prepares a lighting means to irradiate light in the outside of the 1st substrate of the above.
[Claim 18] Electronic equipment characterized by having liquid crystal equipment according to claim 1 or 2.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to liquid crystal equipment, its manufacture method, and the electronic equipment constituted using the liquid crystal equipment.
[0002]
[Description of the Prior Art] In recent years, liquid crystal equipment is widely used as a display of electronic equipment, such as a portable telephone, a Personal Digital Assistant machine, and a wrist watch. By having two or more display dots arranged for example, in in the shape of a matrix, and controlling the voltage impressed to liquid crystal for every display dots of these, this liquid crystal equipment modulates the light which passes this liquid crystal for every display dot, and, thereby, displays images, such as a character, a number, and a figure, outside.
[0003] In the liquid crystal equipment of the above-mentioned composition, it is known that reflected type liquid crystal equipment and penetrated type liquid crystal equipment are in liquid crystal according to the method which supplies light. Here, after carrying out incidence of the reflected type liquid crystal equipment to liquid crystal equipment from an observation side, it is liquid crystal equipment of the structure which displays using the light reflected by the background of liquid crystal. On the other hand, penetrated type liquid crystal equipment is liquid crystal equipment of the structure which displays using the light from the lighting system arranged in the background of liquid crystal.
[0004] Since the above-mentioned reflected type liquid crystal equipment does not have a lighting system called a back light etc., power consumption is small and is used abundantly as a display of various electronic equipment from the former. However, this reflected type liquid crystal equipment had the problem that it was difficult to check a display by looking in the dark place in order to display using outdoor daylight, such as the natural light and lighting light. Then, although outdoor daylight is used like reflected type liquid crystal equipment in a bright place, the liquid crystal equipment of the form which enabled the check by looking of a display with the internal light source is proposed in the dark place. That is, this liquid crystal equipment has adopted the means of displaying which combines a reflected type and a penetrated type, and it enables it to perform a clear display, even when the circumference is dark, reducing power consumption by changing to the means of displaying of a reflective display and a transparency display either according to a surrounding luminosity. Hereafter, on these specifications, the thing of this kind of liquid crystal equipment is called transflective reflection type liquid crystal equipment.
[0005] As this transflective reflection type liquid crystal equipment, the thing equipped with the transflective reflective film and the so-called one-way mirror is known conventionally. It is made to reflect this transflective reflective film to some extent by optimizing the thickness of a metal membrane called the aluminum used as a reflective film in the usual optical field at the same time it penetrates light to some extent. however, membrane formation technology, such as a mask spatter, is required to form a transflective reflective film, and, in addition to a process being complicated, there is a fault that dispersion in permeability and a reflection factor becomes large since dispersion in thickness is large
[0006] Then, in order to conquer the fault of the above-mentioned transflective reflective film, the slit for light transmissions, i.e., the liquid crystal equipment of the structure which formed opening in the reflective film, was proposed. Drawing 6 shows the transflective reflection type electrochromatic display equipment of a passive matrix which is an example of the liquid crystal equipment of such composition. With this liquid crystal equipment 70, liquid crystal 73 is pinched among the transparent substrates 71 and 72 of a couple. On the liquid crystal side front face of the lower substrate 71, the laminating of the reflective film 74, a light filter 75, the overcoat film 76, a silicon oxide 77, and the segment electrode 78 is carried out to order. Moreover, the common electrode 79 is formed on the liquid crystal side front face of the upper substrate 72.
[0007] The light filter 75 formed on the lower substrate 71 has the pigment layers 75r, 75g, and 75b of the color from which red (R), green (G), and blue (B) differ, and these pigment layers are seen from arrow A, and are superficially arranged in the predetermined pattern, shape of for example, a stripe. Moreover, with a transparent electric conduction film called ITO (Indium Tin Oxide:indium stannic-acid ghost) etc., the segment electrode 78 is seen from arrow A, and is formed in the shape of a stripe. On the other hand, the common electrode 79 formed on the upper substrate 72 is formed with a transparent electric conduction film called ITO etc., and is formed in the direction which intersects perpendicularly with the above-mentioned segment electrode 78 in the shape of a stripe.
[0008] The reflective film 74 formed on the lower substrate 71 is formed by the metal membrane with a high reflection factor called aluminum etc. And the slit 80 for light transmissions is formed in this reflective film 74 for every display dot. Moreover, polarizing plates 82a and 82b are arranged on the outside of the vertical substrates 71 and 72, and a lighting system 83 called a back light etc. is arranged further at the rear-face side by the side of the inferior surface of tongue of the lower substrate 71, i.e., observation.
[0009] After the extraneous light which carried out incidence from the upper substrate 72 penetrates liquid crystal 73 and reflects on the front face of the reflective film 74 as Arrow R shows in case the liquid crystal display 70 of the above-mentioned composition is used in the state of a reflective display in a bright place, again, liquid crystal 73 is penetrated and outgoing radiation is carried out to the upper substrate 72 side after that. On the other hand, in case it is used in the state of a transparency display in a dark place, the light by which outgoing radiation is carried out from the lighting system 83 installed in the outside of the lower substrate 71 penetrates the reflective film 74 in the portion of a slit 80, penetrates liquid crystal 73 after that, and outgoing radiation is carried out to the upper substrate 72 side. Such light contributes to a display in each display state.

[0010]
[Problem(s) to be Solved by the Invention] By the way, with the above transflective reflection type liquid crystal equipments, although a metal membrane called aluminum etc. has been conventionally used as a reflective film, by recent years, the still brighter screen is called for, therefore APC which is an alloy with a reflection factor higher than aluminum, i.e., silver, palladium, and a copper (Ag-Pd-Cu) alloy, is used.
[0011] However, APC has the property in which water resistance is weak, in the manufacture process, and let rattlingly electric corrosion (namely, corrosion) by shell electromigration or this whose APC by which pattern formation was carried out ionizes electrically, and begins to melt be a problem in reliability. thus, APC -- since it is hard to use if independent, the laminating of the ITO is carried out to the upper layer or the lower layer of APC, a cascade screen is formed, and using this cascade screen as a transflective reflective film is proposed
[0012] Drawing 7 shows an example of the transflective reflection type electrochromatic display equipment of composition of having prepared the slit for light transmissions in the reflector which consists of the cascade screen of such APC and ITO. In the example of this liquid crystal equipment 60, liquid crystal 63 is pinched among the transparent substrates 61 and 62 of a couple. The segment electrode 67 of the laminated structure which consists of the APC film 65 which has a slit 64, and the ITO film 66 formed on it on the liquid crystal side front face of the lower substrate 61 sees from arrow A, and is formed in the shape of a stripe. Furthermore, the orientation film 68 is formed on the segment electrode 67.
[0013] It sees from [which changes from the light filter 59 which consists of the pigment layers 59r, 59g, and 59b of R, G, and B, the overcoat film 58, and an ITO film to the upper substrate 62 on the other hand] arrow A, and stripe-like the common electrode 57 and the orientation film 56 are formed one by one. Moreover, in the outside front face of the vertical substrates 61 and 62, polarizing plates 82a and 82b are arranged, and a lighting system 83 called a back light etc. is arranged further at the rear-face side by the side of the undersurface of the lower substrate 61, i.e., observation.
[0014] With the above composition, since it functions also as an electrode for a liquid crystal drive at the same time the cascade screen of the APC film 65 on the lower substrate 61 and the ITO film 66 functions as a transflective reflection layer, a light filter cannot be formed on the lower substrate 61, but the light filter 59 is formed on the upper substrate 62.
[0015] Moreover, not only a reflection factor is high, but since specific resistance has the property of a low compared with ITO etc., APC is suitable as an electrode material or a wiring material. When especially compared with ITO, to the specific resistance of ITO being 2x10-4ohmm, the specific resistance of APC is 3.9x10-6ohmm, and has only about 1/50 value. That is, supposing thickness is the same, APC wiring can be managed with 1/50 of ITO wiring of wiring width of face although the same resistance is obtained.
[0016] Therefore, with the liquid crystal equipment of drawing 7 which uses APC for the leading-about wiring between an electrode and IC for a drive, it takes about compared with the liquid crystal equipment of drawing 6 which uses ITO for leading-about wiring, and detailed-ization of wiring can be attained, and so, area of the non-display field of the effective viewing-area circumference and the so-called frame field can be made small, namely, can be narrow-picture-frame-ized. Since the amount of information of liquid crystal equipment [especially] narrow-picture-frame-ized which can be displayed to the occupancy area which can hold in the space where it was restricted in the case of the electronic equipment which builds it in, and the liquid crystal equipment concerned occupies in electronic equipment increases, it is suitable for it to be used for portable small electronic equipment called a cellular phone etc.
[0017] However, there is a possibility that the defect of an electrode and wiring becoming thin when APC which constitutes the segment electrode 67 and leading-about wiring from conventional liquid crystal equipment shown in drawing 7 if use is repeated starts electromigration, or disconnecting depending on the case etc. may occur, and, so, it had become a problem that it is unreliable.
[0018] In order to cancel this trouble, these people proposed the liquid crystal equipment of composition of being shown in drawing 8 and drawing 9 , although it was not yet well-known. In these drawings, the same member as the member used with the liquid crystal equipment 60 shown in drawing 7 will attach and show the same number, and explanation of those members is omitted. With the liquid crystal equipment shown in drawing 8 and drawing 9 , all the upper surfaces of the APC film 65 which constitutes the segment electrode 67, and sides are worn with the ITO film 66. Moreover, all the upper surfaces of the APC film 54 which constitutes wiring 55, and sides are worn with the ITO film 53. In drawing 8 and drawing 9 , a sign 52 shows a black mask and the sign 51 shows the shading layer formed around the viewing area.
[0019] As mentioned above, even when covering the whole region of the front face of an APC film with the ITO film and an electrode and wiring are formed using APC, it can prevent that electromigration occurs to APC and, so, reliable transflective reflection type liquid crystal equipment can be formed in it.
[0020] By the way, with above liquid crystal equipment, while making it correspond to each display dot and forming opening 64, i.e., a slit, in the internal field of the reflective film 65 formed in the substrate 61 by the side of the tooth back of drawing 9 , the lighting system 83 was arranged in the tooth-back side of liquid crystal equipment. According to this composition, the penetrated type display is realized by passing the slit 64 which prepared the light which carried out outgoing radiation from the lighting system 83, and which carried out incidence to the substrate 61 by the side of a tooth back in the reflective film 65, and carrying out outgoing radiation to an observation side.
[0021] It originates in the error which produces in this liquid-crystal equipment in various kinds of processes, such as a process which forms a reflecting layer 65, and a process which sticks the substrates 61 and 62 of a couple, and in order to perform a reflected type display, the case where the ratio of the area of the field in which light is reflected, and the area of the field which makes light penetrate for a penetrated type display differs from an expected ratio, i.e., the ratio on a design, may arise. And there was a problem that dispersion arose by means of displaying for example, at display grace in condition of becoming dark as compared with the case where the luminosity at the time of performing a penetrated type display performs a reflected type display when the area of the field which makes light penetrate is smaller than an expected area and the area of the field in which light is reflected is larger than an expected area.
[0022] this invention aims at making it dispersion not occur for display grace, in case it accomplishes in view of the above-mentioned trouble and liquid crystal equipment is manufactured when various kinds of errors arise, or when it suppresses that dispersion in the rate of surface ratio occurs between a light-transmission field and a light reflex field in a transflective reflective film and means of displaying changes in liquid crystal equipment by this.
[0023]
[Means for Solving the Problem] (1) In order to attain the above-mentioned purpose, the 1st liquid crystal equipment concerning this invention In the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd

substrate It is characterized by having the reflection nature electric conduction film formed in the 1st substrate of the above, the metallic-oxide film of a translucency with which an edge portion contacts the 1st substrate of the above while a laminating is carried out on this reflection nature electric conduction film, and a lighting means to irradiate light towards the aforementioned liquid crystal from the outside of the 1st substrate of the above.

[0024] With this liquid crystal equipment, when light is supplied to liquid crystal from the above-mentioned lighting means, what reached the edge portion of the metallic-oxide film of the aforementioned translucency, for example, an ITO film, among the light penetrates the edge portion, reaches liquid crystal, and is modulated according to the orientation of the liquid crystal. And thereby, a penetrated type display is realized. With the liquid crystal equipment of this composition, it was made to perform a penetrated type display using the light-transmission field formed in the edge portion of a metallic-oxide film rather than performs a transparency display through opening formed in the internal field of a reflective film, i.e., a slit.

[0025] If the error is less than the width-of-face size of an edge portion when the error from which a reflection nature electric conduction film shifts to a longitudinal direction to the extension field of the edge portion of a metallic-oxide film occurs according to this composition, change will not occur in proportion of the area of a light-transmission field and the area of a light reflex field in 1 display dot field. For this reason, even when means of displaying changes in liquid crystal equipment, it can prevent that dispersion occurs for display grace.

[0026] (2) Next, the 2nd liquid crystal equipment concerning this invention In the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate The ground film prepared in the 1st substrate of the above, and the reflection nature electric conduction film formed on this ground film, While a laminating is carried out on this reflection nature electric conduction film, an edge portion is characterized by having the metallic-oxide film of the translucency in contact with the aforementioned ground film, and a lighting means to irradiate light towards the aforementioned liquid crystal from the outside of the 1st substrate of the above.

[0027] As for the point that this 2nd liquid crystal equipment differs from the 1st above liquid crystal equipment, a ground film is formed in the bottom of a reflection nature electric conduction film, and the edge portion of a metallic-oxide film is contacting the above-mentioned ground film rather than contacting the 1st substrate. With the liquid crystal equipment of this composition which prepared the ground film, since a reflection nature electric conduction film can be covered much more certainly from an external environment with a metallic-oxide film, it can prevent much more certainly that the trouble of electromigration etc. occurs on a reflection nature electric conduction film.

[0028] (3) In each liquid crystal equipment of the above-mentioned composition, the aforementioned edge portion in contact with the aforementioned edge portion or the aforementioned ground film in contact with the 1st substrate of the above can constitute the light-transmission section within one display dot in the liquid crystal display of a transflective reflective method. It is the thing of the minimum display unit at the time of displaying images ["dot / display / one"], such as a character and a number, in a viewing area here. specifically In performing a full color display using the three primary colors, such as R (red), G (green), and B (blue), and the three primary colors, such as C (cyanogen), M (Magenta), and Y (yellow) It is a dot field corresponding to one of each of the coloring matter films, such as R, G, and B, and is the thing of the pixel field where the electrodes of a couple overlap mutually in a monochromatic monochrome display. In addition, when performing a full color display using the three primary colors, such as R, G, and B, three display dots corresponding to each of those colors gather, and one pixel is formed.

[0029] Moreover, in the liquid crystal equipment of the above-mentioned composition, the aforementioned ground film can contain a metallic oxide. As a metallic oxide, ITO is employable, for example.

[0030] Moreover, in the liquid crystal equipment of the above-mentioned composition, the reflecting layer in which the light of a blue component is reflected can be prepared in the upper surface of the aforementioned reflection nature electric conduction film. When using APC as a reflection nature electric conduction film, reflection of the light of the wavelength which is equivalent to a blue component in the light reflected by this APC may become weak. If the reflecting layer which reflects the light of a blue component in the upper surface of a reflection nature electric conduction film is prepared about this, the fall of the blue component in the display screen can be compensated.

[0031] Next, in the liquid crystal equipment of the above-mentioned composition, the aforementioned reflection nature electric conduction film and the aforementioned metallic-oxide film can constitute the 1st electrode for impressing voltage to the aforementioned liquid crystal. Since an electrode makes a light reflex film serve a double purpose, while the composition of liquid crystal equipment becomes easy compared with the case where a light reflex film is formed apart from an electrode according to this composition, liquid crystal equipment can be manufactured easily.

[0032] Next, the liquid crystal equipment of the above-mentioned composition can have the coloring layer prepared corresponding to the intersection field of the 2nd electrode which countered the 1st electrode of the above and was formed on the 2nd substrate of the above, and the 1st electrode of the above and the 2nd electrode of the above. Thereby, liquid crystal equipment can perform color display. And even when means of displaying changes between a reflected type, a penetrated type, etc., it can prevent that change occurs for the display grace of color display. In addition, when a coloring layer contains the three primary colors of R, G, B, or C, M and Y, a full color display can be performed.

[0033] Next, the liquid crystal equipment concerning this invention can be constituted as liquid crystal equipment of a passive matrix, and the stripe-like electrode which crosses mutually in this case is formed in each on the substrate of these couples. Moreover, the liquid crystal equipment concerning this invention can also be constituted as liquid crystal equipment of an active matrix, and the 1st electrode of the above is constituted as a dot-like electrode in this case.

[0034] Next, the liquid crystal equipment of the above-mentioned composition can have the 2nd electrode which countered the 1st electrode of the above and was formed on the 2nd substrate of the above, the wiring which leads to the 1st electrode of the above, and the wiring which leads to the 2nd electrode of the above. And a viewing area is formed of the meeting of the intersection field of the 1st electrode of the above, and the 2nd electrode of the above, and in this composition, the wiring which leads to the wiring and the 2nd electrode of the above which are connected with the 1st electrode of the above exists in the outside of the aforementioned viewing area, at least one side of the aforementioned wiring is formed of a metallic oxide, and in it, a reflection nature electric conduction film can be constituted so that it may not contain.

[0035] Generally wiring is formed in fields other than a viewing area, i.e., the field to which liquid crystal does not exist, in many cases. In this case, supposing a reflection nature electric conduction film called APC etc. is contained in wiring, possibility that electromigration will occur in the APC will become high. On the other hand, if a measure is taken so that a reflection nature electric conduction film may not be included in wiring, the possibility of generating of electromigration can prevent a bird clapper highly.

[0036] Next, in the liquid crystal equipment of the above-mentioned composition, the aforementioned reflection nature electric

conduction film can be formed with the alloy containing a silver simple substance or silver. As an alloy containing silver, APC which is silver, palladium, and a copper alloy can be considered, for example. If a reflection nature electric conduction film is formed by such material, the high rate of the reflected light can be obtained and remarkable low resistance-ization can be further attained compared with the case where only a metallic-oxide film called ITO etc. is used.
[0037] Next, in the liquid crystal equipment of the above-mentioned composition, it can prevent certainly that deterioration occurs on the reflection nature electric conduction film by being able to form the aforementioned metallic-oxide film by ITO, and covering a reflection nature electric conduction film with this metallic-oxide film.
[0038] Next, as for the area of the aforementioned edge portion in contact with the 1st substrate of the above, or the aforementioned ground film, in the liquid crystal equipment of the above-mentioned composition, it is desirable that it is [of the area of one display dot to which this edge portion belongs] 30 - 50% desirably 10 to 70%. According to the experiment of an artificer, it has prevented certainly that display quality changed a lot between the penetrated type displays with a reflected type display by setting up the rate of the area of an edge portion as mentioned above.
[0039] (4) Next, the manufacture method of the 1st liquid crystal equipment concerning this invention In the manufacture method of the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate It is characterized by having the process which forms a reflection nature electric conduction film on the 1st substrate of the above, the process which forms the metallic-oxide film of a translucency on the aforementioned reflection nature electric conduction film so that an edge portion may contact the 1st substrate of the above, and the process which prepares a lighting means to irradiate light in the outside of the 1st substrate of the above. According to the manufacture method of the liquid crystal equipment of this composition, the liquid crystal equipment of composition of having indicated above can be manufactured certainly.
[0040] (5) Next, the manufacture method of the 2nd liquid crystal equipment concerning this invention In the manufacture method of the liquid crystal equipment which arranges liquid crystal and changes between the 1st substrate and the 2nd substrate The process which forms a ground film on the 1st substrate of the above, and the process which forms a reflection nature electric conduction film on this ground film, It is characterized by having the process which forms the metallic-oxide film of a translucency on the aforementioned reflection nature electric conduction film so that an edge portion may contact the aforementioned ground film, and the process which prepares a lighting means to irradiate light in the outside of the 1st substrate of the above. According to the manufacture method of the liquid crystal equipment of this composition, the liquid crystal equipment of composition of having indicated above can be manufactured certainly.
[0041] As for the point that the manufacture method of this 2nd liquid crystal equipment differs from the manufacture method of the 1st liquid crystal equipment as stated above, a ground film is formed in the bottom of a reflection nature electric conduction film, and the edge portion of a metallic-oxide film is contacting the above-mentioned ground film rather than contacting the 1st substrate. If a ground film is prepared, since a reflection nature electric conduction film can be covered much more certainly from an external environment with a metallic-oxide film, it can prevent much more certainly that the trouble of electromigration etc. occurs on a reflection nature electric conduction film.
[0042] (6) Next, it is constituting-using liquid crystal equipment of composition of having indicated above characterized by the electronic equipment concerning this invention. According to this electronic equipment, when means of displaying changes in liquid crystal equipment (for example, when means of displaying changes between the penetrated type displays with a reflected type display), it can prevent that dispersion occurs for display grace but.
[0043]
[Embodiments of the Invention] (The 1st operation form of liquid crystal equipment) Drawing 1 shows 1 operation form of the liquid crystal equipment concerning this invention. This operation form is a passive matrix, is a COG (Chip On Glass) method, and is an operation form at the time of applying this invention to the liquid crystal equipment in which color display is possible. Moreover, drawing 2 shows the cross-section structure of liquid crystal equipment where the I-I line in drawing 1 was followed. Moreover, drawing 3 shows the superficial structure of the electrode in the 1-pixel portion of the liquid crystal equipment shown in drawing 1 . Moreover, drawing 4 shows the superficial physical relationship of the reflection nature electric conduction film and light filter in the 1-pixel portion of the liquid crystal equipment shown in drawing 1 . In addition, in each above-mentioned drawing, in order to show structure intelligibly, the thickness of each component, the ratio of a size, etc. differ from the actual thing. In drawing 1 , when the lower substrate 2 whose flat-surface configuration is a rectangle-like, and the upper substrate 3 of each other which is similarly a rectangle-like are stuck by the annular sealant 4 in those circumferences, the liquid crystal equipment 1 concerning this operation form counters mutually, and is arranged. The lower substrate 2 and the upper substrate 3 of these are formed of transparent substrates, such as glass and plastics.
[0044] Opening of a part of sealant 4 is carried out by the one-side (namely, surface in drawing 1) side of each substrates 2 and 3, and it serves as the liquid crystal inlet 5. Moreover, as shown in drawing 2 , in the gap surrounded by both substrates 2 and 3 and sealants 4, liquid crystal 23, for example, STN (Super Twisted Nematic) liquid crystal, is enclosed, and the liquid crystal inlet 5 of drawing 1 is closed with the sealing agent 6 in the state.
[0045] In drawing 1 , the dimension of the lower substrate 2 is formed more greatly than the upper substrate 3. Moreover, in those one side (namely, surface in drawing 1), the upper substrate 3 and the lower substrate 2 are stuck so that those edges may gather, and in the three remaining sides (namely, the lower side in drawing 1 , the right-hand side, left part), they are stuck so that the periphery section of the lower substrate 2 may ****** to the exterior of the upper substrate 3. And IC7 for a drive is mounted in the overhang section by the side of the lower side of the lower substrate 2, and the electrode of the both sides of the upper substrate 3 and the lower substrate 2 drives by this IC7 for a drive. In addition, the sign 8 shows the annular shading layer for shading the circumference of an effective viewing area.
[0046] In drawing 1 , on the lower substrate 2, the segment electrode 10 of the shape of two or more straight line which extends in the lengthwise one in drawing is formed in parallel mutually, and is formed in the shape of a stripe as a whole. On the other hand on the upper substrate 3, the common electrode 11 of the shape of two or more straight line which extends in the longitudinal direction in drawing so that it may intersect perpendicularly with the segment electrode 10 is formed in parallel mutually, and it is formed in the shape of a stripe as a whole.
[0047] In drawing 2 , the lighting system 25 is arranged as a back light at the rear-face side by the side of the inferior surface of tongue of the lower substrate 2, i.e., observation. Moreover, the light filter 13 is formed in the liquid crystal side front face of the upper substrate 3. This light filter 13 is formed by arranging in a stripe array as shows each pigment layers 13r, 13g, and 13b of R, G, and B to a proper array pattern, for example, drawing 4 . In addition, the array of a pigment layer can also be considered as for example, a delta array, a mosaic array, etc. in addition to a stripe array. It is divided with the black mask 33 between each

pigment layers 13r, 13g, and 13b. This black mask 33 is formed with the metal of for example, resin black or shading nature comparatively called the low chromium of a reflection factor etc.
[0048] Each pigment layers 13r, 13g, and 13b are arranged corresponding to the extension direction (namely, space perpendicular direction of drawing 2) of each segment electrode 10, and one pixel is constituted by three display dots of R, G, and B which were located in a line with the longitudinal direction shown in drawing 2 . The ground film 35 is formed in the liquid crystal side front face of the lower substrate 2 of ITO, the laminated structure which consists of the APC film 18 as a reflection nature electric conduction film and the ITO film 19 as a metallic-oxide film on the ground film 35 is formed, and the segment electrode 10 is constituted by this laminated structure. Here, the APC film 18 functions as a reflective film while constituting an electrode. Moreover, on the segment electrode 10, the orientation film 20 which consists of a polyimide etc. is formed. And before sticking both the substrates 2 and 3, orientation processing, for example, rubbing processing, is performed to this orientation film 20.
[0049] In drawing 1 , the leading-about wiring 14 is pulled out towards the sealant 4 about the common electrode 11 of the top half of drawing 1 among two or more common electrodes 11 from the right end of the common electrode 11. And it applies to the lower substrate 2 from the upper substrate 3 through the vertical flow material 41 which consists of the electric conduction particle made to mix into a sealant 4, and connects electrically, and these leading-about wiring 14 is taken about by the periphery section of the lower substrate 2, and is further connected to the output terminal of IC7 for a drive.
[0050] Similarly, about the common electrode 11 of the bottom half of drawing 1 , the leading-about wiring 14 is pulled out towards the sealant 4 from the left end of the common electrode 11. And it applies to the lower substrate 2 from the upper substrate 3 through the vertical flow material 41 which consists of an electric conduction particle made to mix into a sealant 4, and connects electrically, and these leading-about wiring 14 is taken about by the periphery section of the lower substrate 2, and is further connected to the output terminal of IC7 for a drive. On the other hand, about the segment electrode 10, the leading-about wiring 15 is pulled out towards a sealant 4 from the soffit of the segment electrode 10, and is connected to the output terminal of IC7 for a drive as it is.
[0051] In drawing 2 , the leading-about wiring 14 and 15 is constituted by the cascade screen of the APC film 18 and the ITO film 19 like the segment electrode 10. Moreover, in drawing 1 , the wiring 16 for an input for supplying various signals to IC7 for a drive is formed towards the input terminal of IC7 for a drive from the lower side of the lower substrate 2.
[0052] In the segment electrode 10 and the leading-about wiring 14 and 15, the edge portion of the ITO film 19 is jutted out to the outside of the APC film 18, and the base of the edge portion touches the upper surface of the ground film 35. For this reason, a laminating is not only carried out only to the upper surface of the APC film 18, but the ITO film 19 is formed so that the side of the APC film 18 may also be worn.
[0053] On the front face of the light filter 13 formed in the liquid crystal side front face of the upper substrate 3, the overcoat film 21 for protecting the front face of each pigment layer is formed at the same time it carries out flattening of the level difference between each pigment layer. Resin films, such as an acrylic and a polyimide, are sufficient as this overcoat film 21, and inorganic films, such as a silicon oxide, are sufficient as it. Furthermore, on the front face of the overcoat film 21, the common electrode 11 which consists of a monolayer of ITO sees from arrow A in the space longitudinal direction of drawing 2 , and is formed in the shape of a stripe, and the orientation film 22 which consists of a polyimide etc. on the front face is formed. Before sticking both the substrates 2 and 3, orientation processing, for example, rubbing processing, is performed to this orientation film 22.
[0054] In drawing 2 , the width of face W of the black mask 33 is formed almost equally to the interval P1 of ITO film 19 comrades in two display dots which adjoin mutually. And when a substrate 2 and a substrate 3 are stuck correctly, it is set up so that the side periphery of the black mask 33 and the side periphery of the ITO film 19 may see from arrow A and may be in agreement in position. Drawing 3 shows this superficially and the lengthwise side of the black mask 33 and its side of the ITO film 19 which constitutes the segment electrode 10 correspond in position about lengthwise [of drawing] as illustration.
[0055] Moreover, in drawing 2 , in the front face of the lower substrate 2 of the position corresponding to the both sides of the black mask 33, it is the edge portion of the ITO film 19, and the portion 34 in contact with the ground film 35 is arranged. This edge portion 34 constitutes the light-transmission field for making the light penetrate and leading to liquid crystal 23, when a lighting system 25 emits light. On the other hand, when extraneous lights, such as sunlight and indoor light, carry out incidence of the APC film 18 from the upper substrate 3 side, it constitutes the light reflex field in which the extraneous light is reflected. As shown in drawing 3 , the edge portion 34 of the ITO film 19 located in the outside of the APC film 18 is located along the lengthwise extension direction of the black mask 33 in each display dot which is the rectangle region divided with the black mask 33.
[0056] In drawing 2 , the segment electrode 10 and the leading-about wiring 14 and 15 have the two-layer structure of the APC film 18 and the ITO film 19. It has the property in which water resistance of itself is [a reflection nature electric conduction film called APC film 18 grade] weak, and electromigration tends to happen at the time of use. Since the ITO film 19 which constitutes the segment electrode 10 and the leading-about wiring 14 and 15 from the point and this operation form is completely covered with all the upper surfaces of the APC film 18, and sides By adhesion of the moisture in a manufacture process, the problem that the APC film 18 corrodes, that originate in contamination of the front face of the APC film 18, and electromigration occurs on the APC film 18, etc. can be avoided, and, so, reliable liquid crystal equipment can be formed. Furthermore, since it can prevent that the reflection factor of the APC film 18 falls into a manufacture process by covering the whole region of the front face of the APC film 18 which is prepared in a viewing area and functions also as a reflective film with the ITO film 19, the liquid crystal equipment of the outstanding property that a bright display can be attained at the time of a reflective display can be manufactured with the sufficient yield.
[0057] Moreover, with the liquid crystal equipment of this operation gestalt, since the black mask 33 was formed in the light filter 13 on the upper substrate 3 as shown in drawing 2 , a manufacture process, especially the manufacture process by the side of the lower substrate 2 can be simplified. Moreover, since electric resistance becomes low by including the APC film 18, the leading-about wiring 14 and 15 can attain detailed-ization of the line breadth of those wiring, consequently can realize narrow picture frame-ization.
[0058] Furthermore, with this operation gestalt, since it decided to bear by one IC7 for a drive which prepared the drive of the segment electrode 10, and the drive of the common electrode 11 on the front face of the lower substrate 2 using the vertical flow material 41 in drawing 1 , a frame field can be narrowed as a whole and narrow picture frame-ization can be attained also by this. Thereby, according to this operation gestalt, the suitable liquid crystal equipment for small portable electronic equipment can be offered.
[0059] In drawing 2 , the width of face W of the black mask 33 is mostly in agreement with the interval P1 of the ITO film 19

contained in two display dots which adjoin mutually, and is set up smaller than the interval P2 of two APC films 18 which adjoin still more nearly mutually. Furthermore, it is set up if the amount of gaps (for example, the maximum amount of gaps which may happen) produced at the time of the lamination of the upper substrate 3 and the lower substrate 2 is set to delta so that it sets like the erector of the liquid crystal equipment of this operation gestalt, and the size D from the edge of the black mask 33 to the edge of the APC film 18 may become larger than the above-mentioned amount delta of gaps, namely, so that it may become D>delta. In addition, in the case of this operation gestalt, the size D from the edge of the black mask 33 to the edge of the APC film 18 is in agreement with the size from the edge of the ITO film 19 in one segment electrode 10 to the edge of the APC film 18.

[0060] if the above thing is seen by drawing 3 — the border line of the segment electrode 10 — also taking — it does not correct, but it is the side edge of the ITO film 19, and the border line of the black mask 33 is in agreement with the line which shows the side edge of the ITO film 19 And the side edge of the APC film 18 is located inside the ITO film 19. That is, when it sees superficially, the APC film 18 does not exist, marginal long and slender portion 34, i.e., edge portion, of right and left of the segment electrode 10, but only the ITO film 19 exists, and this edge portion 34 is a field which is not covered with the black mask 33 further. Therefore, the edge portion 34 serves as a light-transmission field which the light from a back light 25 (refer to drawing 2) penetrates at the time of a transparency display.

[0061] By using the edge portion 34 shown in drawing 3 and drawing 4 as a light-transmission field, the liquid crystal equipment in this operation gestalt can lose the window part 64 for light transmissions in the liquid crystal equipment shown in drawing 8 , and can call it what prepared the light-transmission field where only the ITO film 19 exists in the edge portion 34 of the segment electrode 10 by narrowing width of face of the part and the APC film 18. Furthermore, the edge portion 34 functions also as structure of preventing it not only functioning as a light-transmission field, but originating in lamination gap and brightness falling at the time of a reflective display.

[0062] Namely, the width of face W of the black mask 52 is in agreement with the interval P2 of APC film 65 comrades like [in the case of the liquid crystal equipment of the structure shown in drawing 9]. Since the black mask 52 will be applied on the APC film 65 if there is lamination gap, although it will be satisfactory if there is no lamination gap when the edge of the black mask 52 has lapped with the edge of the APC film 65 superficially, The effective area as a reflective film of the APC film 65 decreases, and it has the fault that the display at the time of a reflective display becomes dark.

[0063] On the other hand, with the liquid crystal equipment concerning this operation gestalt shown in drawing 2 , since the edge portion 34 was formed and the larger width of face (namely, width of face equivalent to the size D from the edge of the black mask 33 to the edge of the APC film 18) of the edge portion 34 than the amount of lamination gaps is moreover taken, though lamination gap arises, the black mask 33 is not applied on the APC film 18.

[0064] In addition, if lamination gap arises, since a part of edge portion 34 of one side will hide in the black mask 33 in one display dot, although the width of face of the edge portion 34 concerned becomes thin, since the width of face of the part and the edge portion 34 of an opposite side becomes large, the amount of transparency of light does not change as the whole display dot. Thus, structure strong against lamination gap can be offered, there being no bird clapper darkly [the display at the time of a reflective display], and preventing the color mixture of a light filter 13 with the black mask 33, even if there is lamination gap.

[0065] Moreover, in this operation gestalt, the APC film 18 which constitutes the segment electrode 10 and the leading-about wiring 14 and 15 is completely covered with the ITO films 19 and 35 in the upper surfaces, inferior surfaces of tongue, and all the sides, and the whole surface of the APC film 18 is in the state where it was covered with the ITO films 19 and 35. For this reason, the problem of the electromigration resulting from the contamination of the problem of corrosion or the front face of the APC film 18 by adhesion of the moisture in a manufacture process can be avoided much more certainly. Therefore, the liquid crystal equipment concerning this operation gestalt can acquire still higher reliability.

[0066] Furthermore, by having used the APC film 18, the luminosity of the display at the time of a reflective display improves, the saturation of the color of the color at the time of a transparency display improves, it is lost that the manufacture process by the side of the lower substrate 2 is complicated, and the various effects that narrow picture frame-ization of equipment can be attained etc. are acquired.

[0067] With the operation gestalt explained above, as shown in drawing 2 , the ground film 35 was formed in the front face of the lower substrate 2, and the segment electrode 10 18, i.e., an APC film, and the ITO film 19 were formed on the ground film 35. However, it replaces with this, and of course, this invention can be applied also to the liquid crystal equipment of structure which forms directly the segment electrode 67 which consists of the APC film 65 and the ITO film 66 on the lower substrate 61, without forming a ground film in the front face of the cross-section structure 61 shown in drawing 9 , i.e., a lower substrate.

[0068] (The 2nd operation gestalt of liquid crystal equipment) Drawing 5 shows the cross-section structure of the important section of other operation gestalten of the liquid crystal equipment concerning this invention. A different point from the liquid crystal equipment which requires the liquid crystal equipment concerning this operation gestalt for the previous operation gestalt shown in drawing 2 is that the leading-about wiring 24 is the monolayer structure which consists only of the ITO film 35. Since other composition is the same as the case of the previous operation gestalt shown in drawing 2 , the detailed explanation is omitted as the same component attaching and showing the same sign.

[0069] Although both the segment electrode 10 and the leading-about wiring 14 had the two-layer structure which consists of the APC film 18 and the ITO film 19 with the liquid crystal equipment shown in drawing 2 , the leading-about wiring 24 has monolayer structure which consists only of an ITO film 35 with this operation gestalt shown in drawing 5 . And the APC film 18 is formed only on the front face of the lower substrate 2 in a viewing area, and all the upper surfaces of the APC film 18 which constitutes the segment electrode 10, and sides are covered with the ITO film 19 like the case of the operation gestalt of drawing 2 .

[0070] The leading-about wiring 24 has a possibility that it may originate in the front face of the leading-about wiring 24 being polluted, and electromigration may occur on an APC film, when it is easy to be polluted since it is located out of a sealant 4, therefore an APC film is contained in the leading-about wiring 24. On the other hand, in this operation gestalt, there is no fear of electromigration occurring, though the front face of the leading-about wiring 24 is polluted, since the leading-about wiring 24 has become the monolayer structure which consists only of the ITO film 35, i.e., the structure which does not contain an APC film, as shown in drawing 5 .

[0071] Also in this operation gestalt moreover, the segment electrode 10 Since the ITO film 19 which has the two-layer structure of the APC film 18 which is a reflection nature electric conduction film, and the ITO film 19 which is a metallic-oxide film, and constitutes the segment electrode 10 is completely covered with all the upper surfaces of the APC film 18, and sides, The problem of the corrosion by adhesion of the moisture in a manufacture process, the problem of the electromigration resulting

from contamination of the front face of the APC film 18, etc. can be avoided, and, for this reason, reliable liquid crystal equipment can be constituted.
[0072] (The 3rd operation gestalt of liquid crystal equipment) Drawing 10 shows other operation gestalten of the liquid crystal equipment concerning this invention. While an extraneous light fully functions as a reflected type in a certain case, the liquid crystal equipment 90 shown here is a half-transparency half reflection type which functions as a penetrated type by making a back light turn on, when an extraneous light is inadequate. Drawing 11 is the fragmentary sectional view showing the composition at the time of fracturing the liquid crystal equipment 90 of drawing 10 along the direction of X.
[0073] In drawing 10 , liquid crystal equipment 90 is formed by attaching a lighting system 25 to a liquid crystal panel 100 as a back light. A liquid crystal panel 100 has the composition that the TN (Twisted Nematic) type liquid crystal 160 was enclosed in this gap while it maintains a fixed gap and is stuck by the sealant 110 in which the conductive particle 114 to which the front-face side substrate 200 located in an observation side and the tooth-back side substrate 300 located in the tooth-back side serve as a spacer was mixed, as shown in drawing 11 .
[0074] In addition, although the sealant 110 meets the inner circumference edge of the front-face side substrate 200 and is formed in one [a gap or] substrate, in order to enclose liquid crystal 160, the part is carrying out opening of it. For this reason, a part for the opening is closed with the sealing agent 112 in drawing 10 after enclosure of liquid crystal.
[0075] Now, it is in the front-face side substrate 200, and is extended and formed in the direction of X which is a line writing direction, two or more scanning [opposed face] electrode 210, i.e., a common electrode, with the tooth-back side substrate 300. And it is extended and formed in the direction of the Y it is in the tooth-back side substrate 300 on the other hand, and is the direction of a train, whose two or more data [opposed face] electrode 310, i.e., segment electrode, with the front-face side substrate 200. Therefore, with this operation gestalt, in the field to which the common electrode 210 and the segment electrode 310 cross mutually, since voltage is impressed to liquid crystal 160 by two electrodes, this intersection field will function as one display dot. Moreover, IC124 for a drive for driving IC122 for a drive and the segment electrode 310 for driving the common electrode 210 is mounted in two sides which are in the tooth-back side substrate 300, and were jutted out of the front-face side substrate 200 by COG (Chip On Glass) technology so that it may mention later, respectively. Furthermore, the FPC (Flexible Printed Circuit) substrate 150 is joined by the outside of the field where IC124 for a drive is mounted between these two sides.
[0076] The common electrode 210 formed in the front-face side substrate 200 is connected to the end of the wiring 350 formed in the tooth-back side substrate 300 through the conductive particle 114 mixed in the sealant 110 in drawing 11 . On the other hand, the other end of wiring 350 is connected to the output side bump (namely, salient electrode) of IC122 for a drive in drawing 10 . That is, IC122 for a drive has composition which supplies a common signal in the path of wiring 350, the conductive particle 114, and the common electrode 210. In addition, it connects with wiring 360 between the FPC substrates 150 which are the input-side bump and external circuit substrate of IC122 for a drive.
[0077] Moreover, the segment electrode 310 formed in the tooth-back side substrate 300 is connected to the output side bump of IC124 for a drive as it is. That is, IC124 for a drive has composition which supplies a segment signal to the segment electrode 310 directly. In addition, it connects with wiring 370 between the input-side bump of IC124 for a drive, and the FPC substrate 150.
[0078] As shown in a liquid crystal panel 100 at drawing 11 , a polarizing plate 121 and the phase contrast board 123 are formed in the observation side (namely, on drawing) of the front-face side substrate 200. Moreover, a polarizing plate 133 and phase contrast board 133 grade are prepared in the tooth-back side (namely, under drawing) of the tooth-back side substrate 300. In addition, in drawing 1 , illustration of a polarizing plate, a phase contrast board, etc. is omitted. Moreover, when there are few extraneous lights, the lighting system 25 for using as the penetrated type light source is formed in the tooth-back side of the tooth-back side substrate 300 as a back light.
[0079] The detail of a <viewing area>, next the viewing area in a liquid crystal panel 100 is explained. First, the detail of the front-face side substrate 200 is explained. As shown in drawing 11 , the phase contrast board 123 and a polarizing plate 121 are stuck on the superficies of a substrate 200. On the other hand, while the black mask 202 as a shading film is formed and preventing the color mixture between two or more display dots, it is functioning on the inside of a substrate 200 as a frame which specifies a viewing area.
[0080] Furthermore, corresponding to the field where the common electrode 210 and the segment electrode 310 cross, the light filter 204 is formed in the predetermined array corresponding to the opening field of the black mask 202. In addition, although the light filter 204 of R (red), G (green), and B (blue) serves as a suitable stripe array (refer to drawing 12) for the display of a data system and constitutes abbreviation square-like 1 pixel from this operation gestalt three of the display dot of R, G, and B, it is not the meaning which limits this invention to this.
[0081] Next, in drawing 11 , the flattening film 205 which consists of an insulating material carries out flattening of the level difference by the black mask 202 and the light filter 204, and patterning of a transparent electrical conducting material called ITO etc. is carried out to band-like in this field by which flattening was carried out, and it serves as the common electrode 210. And the orientation film 208 which consists of a polyimide etc. is formed in the front face of the common electrode 210. In addition, before sticking on this orientation film 208 with the tooth-back side substrate 300, rubbing processing is performed in the predetermined direction. Moreover, out of the viewing area, since it is unnecessary, the black mask 202, the light filter 204, and the flattening film 205 are not formed near the field of a sealant 110.
[0082] Then, the composition of the tooth-back side substrate 300 is explained. The phase contrast board 133 and a polarizing plate 131 are stuck on the external surface of a substrate 300. On the other hand, all over the inside of a substrate 300, the ground film 303 which has insulation and light-transmission nature is formed. The band-like segment electrode 310 to which the laminating of the reflective pattern 312 as a reflection nature electric conduction film and the transparent electric conduction film 314 as a metallic-oxide film was carried out is further formed in the front face of this ground film 303. In addition, the ground film 303 is formed in the front face of a substrate 300 for raising the adhesion of the reflective pattern 312 formed in the front face of a substrate 300.
[0083] The reflective pattern 312 consists of a silver alloy, for example, APC etc., reflects the light which carried out incidence from the front-face side substrate 200 side, and it is used in order to return to the front-face side substrate 200 again. Under the present circumstances, the reflective pattern 312 does not need to be a perfect mirror plane, and its composition rather reflected irregularly moderately is good. For that, it is desirable to form the reflective pattern 312 in a rolling field to some extent.

[0084] The transparent electric conduction film 314 is somewhat larger than the reflective pattern 312, and it is formed so that the edge portion 34 protruded from the reflective pattern 312, i.e., a periphery portion, may specifically touch the ground film 303.

For this reason, since the front face of the reflective pattern 312 is being completely worn by the transparent electric conduction film 314, with this operation form, the portion which the reflective pattern 312 exposes to the exterior will not exist. In addition, the edge portion 34 acts as the field which is made to penetrate the light which carried out outgoing radiation from the lighting system 25, and is led to liquid crystal 160, i.e., a light-transmission field.

[0085] Next, a protective coat 307 is formed on the front face of the segment electrode 310. It is formed of TiO2 grade and this protective coat 307 makes the protective layer for protecting the segment electrode 310 including the reflective pattern 312 and the transparent electric conduction film 314, and the layer in which many light of a blue component is reflected serve a double purpose. And the orientation film 308 which consists of a polyimide etc. is formed in the front face of a protective coat 307. In addition, before sticking the front-face side substrate 200 and the tooth-back side substrate 300 on this orientation film 308, rubbing processing is performed in the predetermined direction. In addition, for convenience, explanation about the manufacture process of the tooth-back side substrate 300 is given, after explaining wiring 350, 360, and 370.

[0086] Also with reference to drawing 12 besides drawing 11 , it explains near the field in which a sealant 110 is formed among liquid crystal panels 100 <near the sealant> next. Here, drawing 12 is the plan showing the detailed composition near [concerned] the field.

[0087] As shown in these drawings, the common electrode 210 in the front-face side substrate 200 is installed to the field in which a sealant 110 is formed so that the transparent electric conduction film 354 which constitutes wiring 350 may counter the common electrode 210 if it is in the tooth-back side substrate 300 while being installed to the field in which a sealant 110 is formed. For this reason, into a sealant 110, when the spherical conductive particle 114 which served as the spacer is distributed at a suitable rate, the common electrode 210 and the transparent electric conduction film 354 will be electrically connected through the conductive particle 114 concerned.

[0088] Here, as wiring 350 was mentioned above, between the common electrode 210 and the output side bumps of IC122 for a drive is connected electrically, and the laminating of the reflection nature electric conduction film 352 and the transparent electric conduction film 354 is carried out. Among these, similarly, the reflection nature electric conduction film 352 carries out patterning of the same conductive layer as the reflective pattern 312, and it is somewhat larger than the reflection nature electric conduction film 352, and the edge portion specifically protruded from the reflection nature electric conduction film 352 , carries out patterning of the conductive layer as the transparent electric conduction film 314 with the same transparent electric conduction film 354 so that the ground film 303 may be touched. However, as shown in drawing 11 , only the transparent electric conduction film 354 is formed in the field in which a sealant 110 is formed, without carrying out the laminating of the reflection nature electric conduction film 352. If it puts in another way, the reflection nature electric conduction film 352 is the formation field of a sealant 110, avoids a part for a connection with the common electrode 210, and is formed.

[0089] In addition, more, although a twist is also for convenience actually quite large, explanation is given and the path of the conductive particle 114 in drawing 11 seems to have prepared only one piece crosswise [of a sealant 110] for this reason, as shown in drawing 12 , many conductive particles 114 serve as composition arranged at random crosswise [of a sealant 110] at accuracy.

[0090] It explains near the field where ICs 122 and 124 for a drive are mounted among the tooth-back side substrates 300 <near the mounting field of IC for a drive, and the junction field of a FPC substrate>, and the field where the FPC substrate 150 is joined. Drawing 13 is the cross section showing the composition in these fields focusing on wiring. Moreover, drawing 14 is the plan showing the composition of the wiring in the mounting field of IC122 for a drive. In addition, although the wiring 350, 360, and 370 besides the segment electrode 310 is formed in the tooth-back side substrate 300 as mentioned above, here explains taking the case of the wiring 350 and 360 relevant to IC122 for a drive.

[0091] First, although the wiring 350 for supplying the common signal outputted from IC122 for a drive to the common electrode 210 carries out the laminating of the reflection nature electric conduction film 352 and the transparent electric conduction film 354 as mentioned above, as are shown in these drawings, and the field in which IC122 for a drive is mounted shows it to drawing 13 , it has become only with the transparent electric conduction film 354, without forming the reflection nature electric conduction film 352. If it puts in another way, the reflection nature electric conduction film 352 avoids a part for a joint with IC122 for a drive, and is formed.

[0092] Moreover, the wiring 360 for supplying the various signals supplied from the FPC substrate 150 to IC122 for a drive carries out the laminating of the reflection nature electric conduction film 362 and the transparent electric conduction film 364 similarly. Among these, similarly, the reflection nature electric conduction film 362 carries out patterning of the same conductive layer as the reflective pattern 312 or the reflection nature electric conduction film 352, and it is somewhat larger than the reflection nature electric conduction film 362, and the edge portion protruded from the reflection nature electric conduction film 362 carries out patterning of the conductive layer as the transparent electric conduction films 314 and 354 with the same transparent electric conduction film 364 so that the ground film 303 may be touched. However, in the field (drawing 14 , illustration abbreviation) in which the field and the FPC substrate 150 in which IC122 for a drive is mounted among wiring 360 are joined, it is only the transparent electric conduction film 364, without forming the reflection nature electric conduction film 362. If it puts in another way, the reflection nature electric conduction film 364 avoids a part for a joint with a part for a joint and the FPC substrate 150 with IC122 for a drive, and is formed.

[0093] COG mounting of IC122 for a drive is carried out as follows to such wiring 350 and 360, for example. First, although two or more electrodes are prepared in a periphery portion at the whole surface of IC122 for a drive of a rectangular parallelepiped configuration, the bumps 129a and 129b who consist of gold (Au) etc. are beforehand formed in each of such an electrode, respectively.

[0094] And processing is performed in the following sequence. That is, the anisotropy electric conduction film of the shape of a sheet which made a binder 130 called epoxy etc. distribute the conductive particle 134 uniformly is laid in the field to which it is in the tooth-back side substrate 300, and IC122 for a drive should be mounted in the 1st. This anisotropy electric conduction film is pinched by the 2nd by IC122 for a drive which turned the electrode forming face down, and the tooth-back side substrate 300. After IC122 for a drive is positioned by the 3rd, the anisotropy electric conduction film concerned is minded, and it is pressurized and heated by the tooth-back side substrate 300. Input-side bump 129b which inputs the signal from the FPC substrate 150 into the transparent electric conduction film 354 with which output side bump 129a which supplies a common signal among ICs122 for a drive constitutes wiring 350 by this again will be electrically connected to the transparent electric conduction film 364 which constitutes wiring 360 through the conductive particle 134 in a binder 130, respectively. Under the present circumstances, a binder 130 will serve as the sealing agent which protects the electrode forming face of IC122 for a drive from moisture, contamination, stress, etc.

[0095] In addition, although explained taking the case of the wiring 350 and 360 relevant to IC122 for a drive, the wiring 370 for supplying the various signals supplied from the segment electrode 310 and the FPC substrate 150 relevant to IC124 for a drive to IC124 for a drive also has wiring 350 and 360 and same composition here, as is also shown by the parenthesis document in drawing 13 , respectively.
[0096] That is, the segment electrode 310 for supplying the segment signal outputted from IC124 for a drive is only a transparent electrode 312 in the field in which IC124 for a drive is mounted, without forming the reflective pattern 312, although the reflective pattern 312 and the transparent electric conduction film 314 have composition by which the laminating was carried out as mentioned above. If it puts in another way, the reflective pattern 312 avoids a part for a joint with IC124 for a drive, and is formed.
[0097] Moreover, the wiring 370 for supplying the various signals supplied from the FPC substrate 150 to IC124 for a drive has similarly the composition that the laminating of the reflection nature electric conduction film 372 and the transparent electric conduction film 374 was carried out. Among these, the reflection nature electric conduction film 372 carries out patterning of the same conductive layer as the reflective pattern 312 or the reflection nature electric conduction films 352 and 362. Moreover, the transparent electric conduction film 374 is somewhat larger than the reflection nature electric conduction film 372, and it carries out patterning of the same conductive layer as the transparent electric conduction films 314, 354, and 364 so that the edge portion protruded from the reflection nature electric conduction film 372 may touch the ground film 303. However, in the field in which the field and the FPC substrate 150 in which IC124 for a drive is mounted among wiring 370 are joined, the reflection nature electric conduction film 372 is only the transparent electric conduction film 374, without being prepared. If it puts in another way, the reflection nature electric conduction film 372 avoids a part for a joint with a part for a joint and the FPC substrate 150 with IC124 for a drive, and is formed.
[0098] And IC124 for a drive will be connected through an anisotropy electric conduction film like IC122 for a drive to such a segment electrode 310 and wiring 370.
[0099] Moreover, when the FPC substrate 150 is joined to wiring 360 and 370, an anisotropy electric conduction film is used similarly. By this, in the FPC substrate 150, the wiring 154 formed in a base material 152 like a polyimide will be electrically connected through the conductive particle 144 in a binder 140 to the transparent electric conduction film 374 which constitutes the transparent electric conduction film 364 and wiring 370 which constitute wiring 360, respectively.
[0100] <Manufacture process> Here, the manufacture process of the liquid crystal panel mentioned above, especially the manufacture process of a tooth-back side substrate are explained with reference to drawing 15 . In addition, suppose that it explains focusing on the viewing area which the common electrode 210 and the segment electrode 310 intersect here. First, as shown in drawing 15 (a), all over the inside of a substrate 300, Ta 2O5 and SiO2 grade are deposited by sputtering etc., and the ground film 303 is formed. Then, as shown in drawing 15 (b), conductive-layer 312' of the reflection nature which makes a silver simple substance or silver a principal component is formed by sputtering etc. As this conductive-layer 312', the alloy which contains platinum (Pt) and copper (Cu) other than about 98% of silver (Ag) by the weight ratio, for example, the alloy of silver copper and gold, and a further have the desirable alloy of silver, (Ruthenium Ru), and copper etc.
[0101] Then, as shown in drawing 15 (c), patterning of conductive-layer 312' is carried out using photolithography technology and etching technology, it is used as the reflective pattern 312 in a viewing area, and let them be the reflection nature electric conduction films 352, 362, and 372 out of a viewing area.
[0102] Then, as shown in drawing 15 (d), conductive-layer 314' called ITO etc. is formed by sputtering etc. And as shown in drawing 15 (e), patterning of conductive-layer 314' is carried out using photolithography technology and etching technology, it is used as the transparent electric conduction film 314 in a viewing area, and let them be the transparent electric conduction films 354, 364, and 374 out of a viewing area. Under the present circumstances, it is made to touch the ground film 303 so that the reflective pattern 312 and reflection nature electric conduction **** 352, 362, and 372 may not be exposed, the periphery portion 34, i.e., the edge portion, of the transparent electric conduction films 314, 354, 364, and 374. By this, after membrane formation of conductive-layer 314', since the front face of the reflective pattern 312 and the reflection nature electric conduction films 352, 362, and 372 is not exposed, these corrosion, ablation, etc. will be prevented. Moreover, since the transparent electric conduction film 314 intervenes between liquid crystal 160 and the reflective pattern 312, it will be prevented that an impurity is eluted in liquid crystal 160 from the reflective pattern 312.
[0103] In addition, about processing after this, although illustration is omitted, if it explains briefly, the protective coat 307 in drawing 11 and the orientation film 308 will be formed in order, and rubbing processing will be performed to the orientation film 308 concerned. Then, such a tooth-back side substrate 300 and the tooth-back side substrate 200 which performed rubbing processing to the orientation film 208 are similarly stuck by the sealant 110 which distributed the conductive particle 114 appropriately.
[0104] Next, it changes into the state near a vacuum and liquid crystal 160 is dropped at a part for opening of a sealant 110. And liquid crystal 160 is enclosed with the whole panel by returning to an ordinary pressure, and a part for the opening concerned is closed with a sealing agent 112 after this. Then, as mentioned above, it becomes the liquid crystal panel 100 as shown in drawing 10 by mounting ICs 122 and 124 for a drive, and the FPC substrate 150.
[0105] The display action of the liquid crystal display concerning such <a display action etc. and composition> next is explained briefly. First, while IC122 for a drive mentioned above impresses selection voltage in predetermined order for every horizontal scanning period to each of the common electrode 210, IC124 for a drive supplies the segment signal according to the contents of a display for the display dot of one line located in the common electrode 210 to which selection voltage was impressed through the corresponding segment electrode 310, respectively. Under the present circumstances, according to the voltage difference impressed by the common electrode 210 and the segment electrode 310, the orientation state of the liquid crystal 160 in the field concerned is controlled for every display dot. the outdoor daylight from an observer side passes through a polarizing plate 121 and the phase contrast board 123 in drawing 11 here -- it is -- a predetermined polarization state -- becoming -- further -- front-face side substrate 200-> -- pass the path of the light-filter 204 -> common electrode 210 -> liquid crystal 160 -> segment electrode 310 -- the reflective pattern 312 is reached, it reflects here, and the path which came now is followed conversely Therefore, in a reflected type, when the orientation state of liquid crystal 160 changes with the voltage differences impressed between the common electrode 210 and the segment electrode 310, the amount of the light which passes a polarizing plate and is finally checked by looking by the observer will be controlled for every display dot after reflection of the reflective pattern 312 among outdoor daylight.
[0106] In addition, in a reflected type, the component of light by the side of low wavelength (namely, blue side) reflected by the protective coat 307 located in the upper layer increases as compared with the component reflected by the reflective pattern

312. The reason for forming such a protective coat 307 is as follows. That is, the property of the wavelength/reflection factor of the reflection nature pattern 312 containing silver has the inclination for a reflection factor to fall as are shown in drawing 16 and the aluminum generally used becomes the low wavelength instead of a flat. Consequently, the blue component of light reflected by the reflective pattern 312 decreases, and since there is an inclination which wears the yellow taste, when performing especially color display, it will have a bad influence on color-reproduction nature. Then, about the light of a blue component, it has prevented that make [many] the component reflected by the protective coat 307 as compared with the component reflected by the reflective pattern 312, and the yellow taste wears on the reflected light which combined this protective coat 307 and the reflective pattern 312.

[0107] on the other hand, when the lighting system 25 located in the tooth-back side of the tooth-back side substrate 300 is made to turn on in drawing 11 , the light from the lighting system 25 concerned passes through a polarizing plate 131 and the phase contrast board 133 — it is — a predetermined polarization state — becoming — further — a tooth-back side substrate 300 -> edge section 34 -> segment — pass the path of the substrate 200 -> polarizing plate 201 the front-face side of electrode 310 -> liquid crystal 160 -> common electrode 210 -> — outgoing radiation is carried out to an observer side Therefore, also in a penetrated type, when the orientation state of liquid crystal 160 changes with the voltage differences impressed between the common electrode 210 and the segment electrode 310, the amount of the light which passes a polarizing plate 121 among the light which penetrated the edge portion 34, and is finally checked by looking by the observer will be controlled for every display dot.

[0108] Since it will become a reflected type if the liquid crystal equipment concerning this operation form is enough as an extraneous light, and it will mainly become a penetrated type by making a back light 25 turn on the above result if an extraneous light is weak, also in which mold, a display becomes possible. Moreover, with this operation form, since the silver alloy which makes silver or silver a principal component is used for the reflective pattern 312 which reflects light, a reflection factor is raised, and the light which returns to an observer side increases, consequently a bright display is attained. Furthermore, with this operation form, since the portion which the front face of the reflective pattern 312 exposes to the exterior does not exist after forming conductive-layer 312' which constitutes a transparent electrode 310, corrosion, exfoliation, etc. of the reflective pattern 312 are prevented, consequently reliability improves.

[0109] Moreover, since the common electrode 210 prepared in the front-face side substrate 200 is pulled out by the tooth-back side substrate 300 through the conductive particle 114 and wiring 350 and it takes about to near the mounting field of IC124 for a drive with wiring 360 further, in spite of being a simple matrix type, junction to the FPC substrate 150 has been managed with this operation form at one place of one side. For this reason, simplification of a mounting process can be attained.

[0110] On the other hand, since the segment electrode 310 has composition which carried out the laminating of the transparent electric conduction film 314 and the reflective pattern 312 which consists of the silver alloy which makes a silver simple substance or silver a principal component Low resistance-ization is attained and similarly the wiring 350, 360, and 370 besides a viewing area Since it has composition which carried out the laminating of the transparent electric conduction films 354, 364, and 374 and the reflection nature electric conduction films 352, 362, and 372 which consist of the same conductive layer as the reflective pattern 312, respectively, low resistance-ization is attained.

[0111] Since the power supply line of IC122 for a drive which supplies a common signal is contained in the wiring 360 until it results [from the FPC substrate 150] in the input-side bump of IC122 for a drive especially, comparatively high voltage is impressed and, moreover, the wiring distance is long as compared with wiring 370. It becomes impossible for this reason, to disregard the influence according that wiring 360 is high resistance to a voltage drop. On the other hand, in the wiring 360 in this operation form, since low resistance-ization is attained by the laminating, the influence of a voltage drop decreases.

[0112] Moreover, in the field in which IC124 for a drive is mounted among the segment electrodes 310, it is only the transparent electric conduction film 314, without forming the reflective pattern 312. Moreover, in the field in which the field and IC122 for a drive which will be contained in a sealant 110 among wiring 350 are mounted, it is only the transparent electric conduction film 354, without forming the reflection nature electric conduction film 352.

[0113] In the field in which similarly the field and the FPC substrate 150 in which IC122 for a drive is mounted among wiring 360 are joined, it is only the transparent electric conduction film 364, without forming the reflection nature electric conduction film 362. Moreover, in the field in which the field and the FPC substrate 150 in which IC124 for a drive is mounted among wiring 370 are joined, it is only the transparent electric conduction film 374, without forming the reflection nature electric conduction film 372.

[0114] Since a silver alloy etc. lacks in adhesion, taking a measure as mentioned above prepares it in the portion which stress joins because it is not desirable. That is, if priority is given to low resistance-ization of wiring, although the composition which forms a reflective pattern or a reflection nature electric conduction film over the lower layer whole region of a transparent electrode or a transparent electric conduction film will be desirable, in case the chip concerned is exchanged by generating of the faulty connection in the mounting process of IC for a drive with such composition, for example, adhesion may exfoliate, and the reflection nature electric conduction film concerned may exfoliate from a substrate to a low sake. Then, with this operation gestalt, ablation of a silver alloy etc. is beforehand prevented only as a transparent electrode or a transparent electric conduction film into the portion stress is easy to require, without preparing a silver alloy etc.

[0115] As explained above, as shown in drawing 12 , with this operation form, the edge portion 34 of the transparent electric conduction film 314 which constitutes the segment electrode 310, i.e., the transparent portion in which the reflective pattern 312 does not exist, is extended and formed in the direction of Y at both the sides of the shading film 202. And these edge portions 34 act as a light-transmission field at the time of a transparency display, and, on the other hand, the reflective pattern 312 acts as a light reflex field at the time of a reflective display.

[0116] Thus, since the edge portion 34 of the transparent electric conduction film 314 located in the outside of a light reflex field was used as a light-transmission field with this operation form In drawing 12 , though the relative physical relationship of the reflective pattern 312 and the shading film 202 shifts by the cause of a manufacture error or others Even when the thing [that rub, and change will arise in surface ratio between a light reflex field and a light-transmission field if an amount is less than the width-of-face size of the edge portion 34] does not exist and the means of displaying of liquid crystal equipment so changes between a reflected type and a penetrated type, it can prevent that change occurs for display grace.

[0117] (The 4th operation form of liquid crystal equipment) With the operation form shown in drawing 10 , it considered as the composition which drives the common electrode 210 by IC122 for a drive, and drives the segment electrode 310 by IC124 for a drive. this invention can apply both the common electrode 210 and the segment electrode 310 also to the liquid crystal equipment of composition of driving by the driver IC 126 formed into 1 chip, as it is not restricted to such composition, for

example, is shown in drawing 17 .
[0118] With the liquid crystal equipment 190 shown in drawing 17 , although it is as common as the liquid crystal equipment 90 of drawing 10 in the point that the common electrode 210 is formed in the direction of X by two or more extending at the front-face side substrate 200, the common electrode 210 of an upper half is different from the liquid crystal equipment 90 of drawing 10 in the point that the common electrode 210 of left-hand side to a lower half is pulled out, respectively, and is connected to IC126 for a drive from right-hand side.
[0119] IC126 for a drive forms ICs 122 and 124 for a drive in the liquid crystal equipment 90 of drawing 10 into 1 chip. For this reason, the output side of IC126 for a drive is connected also to the common electrode 210 through the wiring 350 besides the segment electrode 310. Moreover, the FPC substrate 150 will supply the signal for controlling IC126 for a drive etc. through wiring 360 (370) from an external circuit (illustration abbreviation).
[0120] Here, the practical wiring layout near the field where IC126 for a drive is mounted is explained. Drawing 18 is the plan showing an example of this wiring layout. As shown in this drawing, after expanding a pitch from the output side of IC126 for a drive, attaching from wiring 350 by the common electrode 210 to taking about to a viewing area, once narrowing a pitch from the output side of IC126 for a drive and extending in the direction of Y, while being crooked at the angle of 90 degrees, a pitch is expanded, and the segment electrode 310 is taken about to the viewing area.
[0121] Wiring 350 is because it takes from the large-sized glass of one sheet, i.e., mother glass, so much, a number decreases and cost quantity is caused, when it is because the reason the pitch is narrowed from the output side of IC126 for a drive in the field which extends in the direction of Y is the dead space which this field does not contribute to a display and this field is large. moreover, since a certain amount of [in order to join the output side bump of IC126 for a drive to wiring 350 with COG technology] pitch is required, about the junction field of IC126 for a drive, the pitch has been expanded conversely
[0122] In addition, in the liquid crystal equipment 190 shown in drawing 17 , if there are few numbers of the common electrode 210, it is good also as composition which pulls out the common electrode 210 concerned only from single-sided one side.
[0123] Moreover, as shown in drawing 19 , IC for a drive is applicable also to the type which is not mounted in a liquid crystal panel 100. That is, with the liquid crystal equipment 290 shown in this drawing, IC126 for a drive is mounted in the FPC substrate 150 by technology, such as a flip chip. In addition, while carrying out bonding of IC126 for a drive by the inner lead using TAB (Tape Automated Bonding) technology, a liquid crystal panel 100 is good also as composition joined by the outer lead. However, with such composition, the number of nodes with the FPC substrate 150 will increase as the number of pixels increases.
(The 5th operation form of liquid crystal equipment) If it was in the liquid crystal equipment 90 shown in drawing 11 , although what has an insulating material as a ground film 303 which consists of a silver alloy etc. was used, it is also possible for this invention not to be restricted to this but to use electrical conducting materials, such as ITO and Sn2O3 grade. It is there, next the operation form using a conductive material as a ground film 303 is explained. In addition, since the liquid crystal equipment concerning this operation form is the same as the liquid crystal equipment 90 shown in drawing 10 in appearance, it is made to explain an internal electrode and focusing on the composition of wiring here.
[0124] Drawing 20 shows the cross-section structure at the time of fracturing the composition of the liquid crystal panel 100 of the liquid crystal equipment 390 concerning this operation form along the direction of X. Moreover, drawing 21 shows the cross-section structure of the field where ICs 122 and 124 for a drive are mounted among the tooth-back side substrates 300, and the field where the FPC substrate 150 is joined.
[0125] In these drawings, the ground film 303 is different from the operation form of drawing 11 at the point which consists of the material which has conductivity and light-transmission nature, such as ITO and Sn 2O3, at the point established in order to raise the reflective pattern 312 as a reflection nature electric conduction film, and the adhesion of the reflection nature electric conduction films 352, 362, and 372 although it is the same as that of the operation form of drawing 11 .
[0126] Patterning of this ground film 303 is carried out to these transparent electric conduction films and the abbreviation same configuration by the same process as the transparent electric conduction films 314, 354, 364, and 374 so that it may mention later.
[0127] if the constitutional feature about this operation form is seen in detail and it is in the segment electrode 310 the 1st, as shown in drawing 20 , the reflective pattern 312 sandwiches with the ground film 303 and the transparent electric conduction film 314 -- having -- in addition -- and among the transparent electric conduction films 314, from the reflective pattern 312, the edge portion 34 which it began to see, i.e., a periphery portion, is formed so that the ground film 303 may be touched For this reason, the segment electrode 310 serves as a three-tiered structure which carried out the laminating of the ground film 303 formed of the electrical conducting material, the reflective pattern 312, and the transparent electric conduction film 314 to turn. However, as shown by the parenthesis document of drawing 21 , the reflective pattern 312 is formed so that a part for a joint with output side bump 129a in IC124 for a drive may be avoided. In addition, the edge portion 34 acts as a light-transmission field at the time of a transparency display.
[0128] Next, if it is in the wiring 350 taken about by the 2nd from output side bump 129a of IC122 for a drive to a part for a connection with the common electrode 210 as shown in drawing 20 and drawing 21 , the reflection nature electric conduction film 352 sandwiches with the ground film 303 and the transparent electric conduction film 354 -- having -- in addition -- and among the transparent electric conduction films 354, from the reflection nature electric conduction film 352, the edge portion which it began to see is formed so that the ground film 303 may be touched For this reason, although wiring 350 serves as a three-tiered structure which carried out the laminating of the ground film 303, the reflection nature electric conduction film 352, and the transparent electric conduction film 354 to turn, the reflection nature electric conduction film 352 avoids a part for a joint with the output side bump in a part for a joint (refer to drawing 20) and IC122 for a drive with the common electrode 210 through the conductive particle 114 (refer to drawing 21), and is formed.
[0129] Next, if it is in the wiring 360 taken about by the 3rd from an end-connection child with the FPC substrate 150 to input-side bump 129b of IC122 for a drive as shown in drawing 21 , the reflection nature electric conduction film 362 sandwiches with the ground film 303 and the transparent electric conduction film 364 -- having -- in addition -- and among the transparent electric conduction films 364, from the reflection nature electric conduction film 362, the edge portion which it began to see is formed so that the ground film 303 may be touched For this reason, although wiring 360 serves as a three-tiered structure which carried out the laminating of the ground film 303, the reflection nature electric conduction film 362, and the transparent electric conduction film 364 to turn, the reflection nature electric conduction film 362 avoids a part for a joint with input-side bump 129b in a part for a joint and IC122 for a drive with the FPC substrate 150 through the conductive particle 144, and is formed.
[0130] Next, if it is in the wiring 370 taken about by the 4th from an end-connection child with the FPC substrate 150 to input-side bump 129b of IC124 for a drive as shown in the parenthesis document of drawing 21 , the reflection nature electric

conduction film 372 sandwiches with the ground film 303 and the transparent electric conduction film 374 — having — in addition — and among the transparent electric conduction films 374, from the reflection nature electric conduction film 372, the edge portion which it began to see is formed so that the ground film 303 may be touched For this reason, although wiring 370 serves as a three-tiered structure which carried out the laminating of the ground film 303, the reflection nature electric conduction film 372, and the transparent electric conduction film 374 to turn, the reflection nature electric conduction film 372 avoids a part for a joint with input-side bump 129b in a part for a joint and IC124 for a drive with the FPC substrate 150 through the conductive particle 144, and is formed.

[0131] In addition, in a part for a joint with a part for a joint and the FPC substrate 150 of IC122,124 for a drive, if shown in drawing 20 and drawing 21 , although it is two-layer [of the ground film 303 and the transparent electric conduction films 314, 354, 364, and 374], it replaces with this and is good also as one of one layer structures.

[0132] Moreover, in this operation form, the ground film 303 is seen superficially and serves as the same configuration as the transparent electric conduction films 314, 354, 364, and 374. For this reason, the planar structure of the display dot of the liquid crystal panel concerning this operation form becomes the same as the case of the previous operation form shown in drawing 3 . Moreover, in the liquid crystal panel 100 concerning this operation form shown in drawing 20 , the planar structure near the mounting field of IC for a drive also becomes the same as the case of the previous operation form shown in drawing 5 .

[0133] A <manufacture process> next the manufacture process of the liquid crystal panel 100 shown in drawing 20 , especially the manufacture process of a tooth-back side substrate are explained with reference to drawing 22 . First, as shown in drawing 22 (a), metallic-oxide material, such as ITO and Sn2O3 grade, is deposited on the whole inside surface of a substrate 300 by sputtering etc., and ground film 303' is formed in it. Then, as shown in drawing 22 (b), conductive-layer 312' of the reflection nature which makes a silver simple substance or silver a principal component is formed by sputtering etc. In addition, about this conductive-layer 312', the same thing as the case of the liquid crystal equipment 90 of drawing 11 can be used.

[0134] Then, as shown in drawing 22 (c), patterning only of conductive-layer 312' formed in ground film 303' is carried out using photolithography technology and etching technology. Of this etching, the reflective pattern 312 is formed by the viewing area, and the reflection nature electric conduction films 352, 362, and 372 are formed out of a viewing area of it.

[0135] Here, in detail, since it is easy to ********** rather than ground film 303' in conductive-layer 312', if a suitable etching solution is used, it is possible, since a selection ratio is different at ground 303' which is a metallic oxide, and conductive-layer 312' which is an alloy to ********** only conductive-layer 312' alternatively. In addition, as such an etching reagent, the mixed solution which uses a phosphoric acid (54%), an acetic acid (33%), a nitric acid (0.6%), and the remainder as water by the weight ratio is mentioned, for example.

[0136] Then, as shown in drawing 22 (d), conductive-layer 314', such as ITO, is formed by sputtering etc. And as shown in drawing 22 (e), patterning of ground film 303' and conductive-layer 314' is simultaneously carried out using photolithography technology and etching technology, and they are formed as the ground film 303 and a transparent electric conduction film 314. By this, the segment electrode 310 will be formed. In addition, patterning of conductive-layer 314' is carried out as transparent electric conduction films 354, 364, and 374 by using ground film 303' as the ground film 303 out of a viewing area, respectively. By this, wiring 350, 360, and 370 will be formed.

[0137] Here, if patterning is carried out somewhat more greatly than the reflective pattern 312 and the reflection nature electric conduction films 352, 362, and 372, since the edge portion protruded from the reflective pattern or the reflection nature electric conduction film among transparent electric conduction films will touch the ground film 303, neither a reflective pattern nor a reflection nature electric conduction film exposes the transparent electric conduction films 314, 354, 364, and 374 and the ground film 303.

[0138] In addition, the processing performed after this is the same as that of the previous operation form shown in drawing 15 , forms the protective coat 307 in drawing 20 , and the orientation film 308 in order, and performs rubbing processing to the orientation film 308 concerned. Then, similarly, the tooth-back side substrate 300 and the tooth-back side substrate 200 which performed rubbing processing to the orientation film 208 are changed into lamination and the state still near a vacuum for the conductive particle 114 by the sealant 110 distributed appropriately, and liquid crystal 160 is dropped at a part for opening of a sealant 110. Then, it returns to an ordinary pressure and a part for the opening concerned is closed with a sealing agent 112. And it becomes the same liquid crystal panel 100 as the operation form shown in drawing 10 by mounting ICs 122 and 124 for a drive, and the FPC substrate 150.

[0139] according to this operation gestalt shown in drawing 20 , the reflective pattern 312 and the reflection nature electric conduction films 352, 362, and 372 which consist of a silver alloy etc. cover completely with the transparent electric conduction films 314, 354, 364, and 374, respectively — having — in addition — and it is pinched with the ground film and transparent electric conduction film which are metallic oxides For this reason, since it is good as compared with the operation gestalt of drawing 11 which used inorganic material and the metallic oxide, the invasion of moisture etc. of adhesion of a ground film and a transparent electric conduction film decreases through these interfaces.

[0140] Moreover, with the operation gestalt of drawing 20 , although the ground film 303 is added as a metallic-oxide film, since the patterning process is used also [films / transparent electric conduction / 314, 354, 364, and 374], as compared with the operation gestalt of drawing 11 , a process does not complicate it.

[0141] Furthermore, with the operation gestalt of drawing 20, also with wiring resistance, except a joint part, since it becomes a three-tiered structure, as compared with the operation gestalt of drawing 11 which is two-layer structure, it can be made low. In addition, about other operation effects, it is the same as that of the operation gestalt of drawing 11 .

[0142] (The 6th operation gestalt of liquid crystal equipment) Although simple matrix type liquid crystal equipment was mentioned as the example and each operation gestalt explained above explained it, this invention is applicable also to the active-matrix type liquid crystal equipment which drives liquid crystal using an active element, i.e., a switching element. The case where this invention is applied to the liquid crystal equipment of the structure of being there, next driving liquid crystal by the active element will be explained.

[0143] In addition, with this operation gestalt, TFD (Thin Filmed Diode:thin film diode) which is a two terminal type active element as an example of an active element will be used. Moreover, since the liquid crystal equipment concerning this operation gestalt is the same as the liquid crystal equipment shown in drawing 1 in appearance, it is made to explain an internal electrode and focusing on the composition of wiring also here. Drawing 23 shows the planar structure for 1 pixel constituted by the meeting of three display dots corresponding to each color of R, G, and B about the liquid crystal panel concerning this operation gestalt. Moreover, drawing 24 shows the cross-section structure according to the II-II line in drawing 23 . In drawing 23 , with the liquid crystal panel of this operation gestalt, while the scanning line 2100 is extended and formed in the direction of X which is a line

writing direction in a front-face side substrate, in a tooth-back side substrate, the data line 3100, i.e., a signal line, is extended and formed in the direction of Y which is the direction of a train.
[0144] And corresponding to a part for each intersection of the scanning line 2100 and the data line 3100, the pixel electrode 330 of the shape of two or more rectangle has arranged in the shape of a matrix further. Among these, the pixel electrode 330 arranged in the same train is connected to the one data line 3100 in common through TFD320, respectively. In addition, in this operation gestalt, the scanning line 2100 is driven by IC122 for a drive, and the data line 3100 is driven by IC124 for a drive, respectively.
[0145] In this operation gestalt, TFD320 is formed in the front face of the tooth-back side substrate 300, TFD[1st]320a Reaches, and has 2nd TFD320b. Moreover, TFD320 has the 1st metal membrane 3116 which is formed on the front face of the ground film 303 which has insulation and light-transmission nature, and was formed with the tantalum tungsten etc., the insulator layer 3118 formed by anodizing the front face of this 1st metal membrane 3116, and the 2nd metal membrane 3122 and 3124 which it was formed in this front face and estranged mutually. The 1st metal membrane 3122 and 3124 is [both] a reflection nature electric conduction film called a silver alloy etc., the 2nd metal membrane 3122 becomes a part of data line 3100 as it is, and, on the other hand, the 2nd metal membrane 3124 is the reflection nature electric conduction film 3320 which constitutes the pixel electrode 330.
[0146] In order that 1st TFD320a may become the 1st metal membrane 3116 of 3118/of the 3122/insulator layers of 2nd metal membrane at turn, in view of a data-line 3100 side and may take the MIM structure of a metal / insulator / metal among TFD(s) 320, the current-voltage characteristic becomes nonlinear over positive/negative both directions.
[0147] On the other hand, 2nd TFD320b becomes the 2nd metal membrane 3124 of 3118/of the 3116/insulator layers of 1st metal membrane at turn, in view of a data-line 3100 side, and 1st TFD320a will have the opposite current-voltage characteristic. Therefore, since TFD320 serves as a form which carried out the series connection of the two diode elements of each other to the retrose, compared with the case where one element is used, the nonlinear characteristic of current-voltage will be symmetrized over positive/negative both directions.
[0148] Patterning of the silver-alloy layer with same reflection nature electric conduction film 3120 which is a part of data line 3100, 2nd metal membrane 3122 and 3124, and reflection nature electric conduction film 3320 of the pixel electrode 330 is carried out. Therefore, with this operation form, it is covered with the transparent electric conduction films 3140 and 3340 which consist of ITO so that these films may not be exposed to the exterior. On the other hand, the data line 3100 is turn from the ground film 303 with the metal membrane 3112, the insulator layer 3114, the reflection nature electric conduction film 3120, and the transparent electric conduction film 3140. Moreover, in drawing 23 , two or more pixel electrodes 330 located in a line with the same line prolonged in the direction of X have countered with the scanning line 2100 of the same line, respectively. This scanning line 2100 is the transparent electrode of the shape of a stripe which consists of ITO like the common electrode 210 in the operation form shown in drawing 12 . For this reason, the scanning line 2100 will function as a counterelectrode of the pixel electrode 330.
[0149] Therefore, the liquid crystal capacity of the display dot corresponding to a certain color will be constituted in a part for the intersection of the scanning line 2100 and the data line 3100 by the scanning line 2100 concerned, the pixel electrode 330, and the liquid crystal 160 pinched among both.
[0150] Since the liquid crystal panel concerning this operation form is constituted as mentioned above, if the selection voltage which TFD320 turns on irrespective of the data voltage currently impressed to the data line 3100 is impressed to the scanning line 2100, the charge according to the difference of the selection voltage concerned and the data voltage concerned will be accumulated at the liquid crystal capacity which TFD320 corresponding to a part for the intersection of the scanning line 2100 concerned and the data line 3100 concerned was turned on, and was connected to turned-on TFD320. Even if it impresses non-choosing voltage to the scanning line 2100 after a charge storage and makes TFD320 concerned turn off, accumulation of the charge in liquid crystal capacity is maintained.
[0151] Here, since the orientation state of liquid crystal 160 changes according to the amount of charges accumulated at liquid crystal capacity, it changes according to the amount of charges by which the quantity of light which passes a polarizing plate 121 (refer to drawing 11 and drawing 20) was also accumulated also in penetrated type and reflection type any. Therefore, a predetermined gradation display is attained by controlling the accumulated dose of the charge in liquid crystal capacity by data voltage when selection voltage is impressed for every display dot.
[0152] A <manufacture process> next the manufacture process of the liquid crystal panel concerning the operation form shown in drawing 23 , and especially the manufacture process of TFT320 prepared in a tooth-back side substrate are explained. Drawing 25 , drawing 26 , and drawing 27 show this manufacture process.
[0153] First, as shown in drawing 25 (a), the ground film 303 is formed all over the inside of a substrate 300 by depositing 5 and SiO2 grade by sputtering etc., or oxidizing thermally the Ta2O tantalum (Ta) film deposited by the sputtering method etc.
[0154] Then, as shown in drawing 25 (b), 1st metal layer 3112' is formed on the upper surface of the ground film 303. Here, as thickness of 1st metal layer 3112', a suitable value is chosen by the use of TFD320 and it is usually about 100-500nm. Moreover, composition of 1st metal layer 3112' is for example, a tantalum simple substance and a tantalum alloy called a tantalum tungsten (TaW) etc.
[0155] Here, when using a tantalum simple substance as 1st metal layer 3112', it can form by the sputtering method, the electron-beam-evaporation method, etc. Moreover, when using a tantalum alloy as 1st metal layer 3112', the element which belongs to the tantalum of a principal component at the 6th - an octavus group in periodic tables, such as others, chromium and molybdenum, a rhenium, an yttrium, a lanthanum, and dace SUPURORIUMU, is added. [tungsten]
[0156] As this alloying element, as mentioned above, a tungsten is desirable, and the content rate has 0.1 - 6 desirable % of the weight. Moreover, in order to form 1st metal layer 3112' which consists of a tantalum alloy, the sputtering method using the mixed target, the KOSUPATTA Ling's method, an electron-beam-evaporation method, etc. are used.
[0157] Furthermore, as shown in drawing 25 (c), patterning of conductive-layer 3112' is carried out using photolithography technology and etching technology, and the metal membrane 3112 used as the lowest layer of the data line 3100 and the 1st metal membrane 3116 which branches from this metal membrane 3112 are formed.
[0158] Then, as shown in drawing 25 (d), the front face of the 1st metal membrane 3116 is oxidized by the anode oxidation method, and an insulator layer 3118 is formed. At this time, the front face of a metal membrane 3112 used as the lowest layer of the data line 3110 also oxidizes simultaneously, and an insulator layer 3114 is formed similarly. A suitable value is chosen by the use and the thickness of an insulator layer 3118 is about 10-35nm with this operation gestalt, for example.
[0159] With this operation gestalt, since TFD320 consists of two, 1st TFD320a and 2nd TFD320b, as compared with the case

where one TFD is used about one display dot, the thickness of an insulator layer 3118 serves as half mostly. In addition, although especially the Chemicals liquid used for anodic oxidation is not limited, 0.01 - 0.1% of the weight of citric-acid solution can be used for it, for example.

[0160] Next, as shown in drawing 25 (e), the dashed line portion 3119 is removed with the 1st metal membrane 3116 used as the foundation among the basic portion 3112 of the data line 3100, i.e., the metal membrane covered by the insulator layer 3114, and the insulator layer 3118 which carried out shell branching. The 1st metal membrane 3116 which TFD[1st]320a Reaches and is shared by 2nd TFD320b by this will be electrically separated with the data line 3100. In addition, about removal of the dashed line portion 3119, the photolithography and etching technology which are generally used are used.

[0161] Then, as shown in drawing 26 (f), conductive-layer 3120' of the reflection nature which makes a silver simple substance or silver a principal component is formed by sputtering etc. In addition, about this conductive-layer 3120', the same thing as conductive-layer 312' in the operation gestalt shown in drawing 22 can be used.

[0162] Furthermore, as shown in drawing 26 (g), patterning of conductive-layer 3120' is carried out using photolithography technology and etching technology, and the reflection nature electric conduction film 3120 in the data line 3100, the 2nd metal membrane 3122 and 3124 in TFD320, and the reflection nature electric conduction film 3320 in the pixel electrode 330 are formed, respectively. The 2nd metal membrane 3122 of TFD320 is a branching portion from the reflection nature electric conduction film 3120, and the 2nd metal membrane 3124 is a part for a lobe from the reflection nature electric conduction film 3320 of the pixel electrode 330. Moreover, in case patterning is carried out, the reflection nature electric conduction films 352, 362, and 372 (refer to drawing 13) in wiring also form conductive-layer 3120' simultaneously. The reflection nature electric conduction film 3120 in this operation gestalt is used as a reflection nature electric conduction film 312 in the operation gestalt shown in drawing 11 etc.

[0163] In addition, about these reflection nature electric conduction films, wiring is avoiding the portion joined to IC for a drive, a FPC substrate, etc., and formed, and this point is the same as that of the case of the operation gestalt shown in drawing 11 etc.

[0164] Next, as shown in drawing 27 (h), conductive-layer 3140' which has the transparency of ITO etc. is formed by sputtering etc. And as shown in drawing 27 (i), patterning of conductive-layer 3140' is carried out using photolithography technology and etching technology, and the transparent electric conduction film 3140 is formed so that the reflection nature electric conduction film 3120 and the 2nd metal membrane 3122 which are called a silver alloy etc. may be covered completely. Similarly, the transparent electric conduction film 3340 is formed so that the reflection nature electric conduction film 3320 and the 2nd metal membrane 3124 may be covered completely.

[0165] Moreover, also about each of the transparent electric conduction films [in / wiring / for conductive-layer 3140'] 354, 364, and 374, in case patterning is carried out, it forms so that the reflection nature electric conduction films 352, 362, and 372 may be covered completely, respectively.

[0166] In addition, about the manufacture process performed after this, it is the same as that of the case of the operation gestalt shown in drawing 15 or drawing 22 . That is, the protective coat 307 in drawing 11 and the orientation film 308 are formed in order, and rubbing processing is performed to the orientation film 308 concerned. Then, similarly, the tooth-back side substrate 300 and the tooth-back side substrate 200 which performed rubbing processing to the orientation film 208 are changed into lamination and the state still near a vacuum for the conductive particle 114 by the sealant 110 distributed appropriately, and liquid crystal 160 is dropped at a part for opening of a sealant 110. Then, it returns to an ordinary pressure and a part for the opening concerned is closed with a sealing agent 112. And it becomes the liquid crystal equipment 90 shown in drawing 10 , and the same liquid crystal panel 100 by mounting ICs 122 and 124 for a drive, and the FPC substrate 150.

[0167] As mentioned above, with this operation form, since the reflection nature electric conduction film 3120 is formed of the same layer as the reflection nature electric conduction film 3320 among the data lines 3100 with the 2nd metal membrane 3122 and 3124 in TFD320, a manufacture process is not complicated so much. Moreover, since the data line 3100 contains the reflection nature electric conduction film 3120 which is low resistance, the wiring resistance will be reduced.

[0168] Moreover, although the 2nd metal membrane 3122 and 3124 and the reflection nature electric conduction films 3120 and 3320 are silver alloys etc., respectively, since it is covered like the reflection nature electric conduction films 352, 362, and 372 in wiring 350, 360, and 370 according to this operation form, without exposing to the exterior with the transparent electric conduction films 3140 and 3340, such as ITO, it becomes possible to prevent corrosion, exfoliation, etc., consequently to raise the reliability of liquid crystal equipment. In addition, although it was the composition which makes a retrose mutually 1st TFD320a and 2nd TFD320b so that it might be symmetrizing over positive/negative both directions about the current-voltage characteristic, if the symmetric property of the current-voltage characteristic is not required so strongly, it is natural [TFD320 in this operation form] that one TFD may only be used.

[0169] First of all, TFD320 in this operation form is an example of 2 terminal type switching element. For this reason, it is also possible to use these elements besides the single element using the ZnO (zinc oxide) varistor, MSI (Metal Semi-Insulator), etc. as an active element for 2 retroses for a series connection or the thing which carried out parallel connection as a 2 terminal type switching element. Furthermore, while preparing a TFT (Thin Film Transistor) element besides these 2 terminal type elements and driving by these, it is good for a part or all of wiring for these elements also as composition using the same conductive layer as a reflective pattern.

[0170] In drawing 23 and drawing 24 , the transparent electric conduction film 3340 prepared on the reflection nature electric conduction film 3320 was formed more widely than the reflection nature electric conduction film 3320, and, so, has jutted out the edge portion 34 of the transparent electric conduction film 3340 to the outside of the reflection nature electric conduction film 3320. And the base of the edge portion 34 touches the ground film 303, as shown in drawing 24 . In drawing 24 , as Arrow R shows, the reflection nature electric conduction film 3320 constitutes a light reflex field from this operation form at the time of a reflective display. Moreover, in case a transparency display is performed using the light from a back light 25, as Arrow T shows to drawing 24 , the edge portion 34 acts as a light-transmission field, and carries out the work which leads light to liquid crystal 160.

[0171] As shown in drawing 23 , the edge portion 34 of the transparent electric conduction film 3340 is annularly formed along with both the lengthwise black mask 33 and the lateral black mask 33 in the display dot which is one rectangle region divided with the black mask 33. Therefore, change is not produced in proportion of the area of the light reflex field in one display dot though position-gap occurs in lengthwise and/or a longitudinal direction according to a certain cause of a manufacture error or others between the reflection nature electric conduction film 3320 and the black mask 33, and the area of a light-transmission field. So, according to this operation form, even when the means of displaying of liquid crystal equipment changes between a reflected type and a penetrated type, it can prevent that display grace changes.

[0172] Although [the operation form shown in an application and <modification> drawing 11] a flow with the common electrode 210 and wiring 350 is performed by the conductive particle 114 mixed in the sealant 110, it is good also as composition which aims at a flow in the field separately prepared outside the limit of a sealant 110.
[0173] Moreover, the common electrode 210 can be formed in the tooth-back side substrate 300, or they can also form the scanning line 2100 in the tooth-back side substrate 300 while they form the data line 3100 in the front-face side substrate 200 while they form the segment electrode 310 in the front-face side substrate 200, since the common electrode 210 and the segment electrode 310 which were shown in drawing 11 , and the scanning line 2100 and the data line 3100 which were shown in drawing 23 have a relative relation mutually.
[0174] Moreover, although the above explanation explained by illustrating the liquid crystal equipment which performs color display using a light filter, this invention is applicable to the liquid crystal equipment which performs monochrome display which does not use a light filter.
[0175] Moreover, although TN type was used as liquid crystal with the above-mentioned operation form the bistability type which has memory nature, such as a BTN (Bi-stable Twisted Nematic) type and a strong dielectricity type, and macromolecule distributed type — further The color (namely, guest) which has an anisotropy in the visible absorption of light in the direction of a major axis and the direction of a minor axis of a molecule may be dissolved in the liquid crystal (namely, host) of fixed molecular arrangement, and liquid crystal called GH (guest host) type which made a liquid crystal molecule and parallel arrange a color molecule may be used.
[0176] Moreover, while a liquid crystal molecule arranges perpendicularly to both substrates at the time of no voltage impressing Perpendicular orientation that a liquid crystal molecule arranges horizontally to both substrates at the time of voltage impression () Namely, while a liquid crystal molecule arranges [as opposed to / both substrates / it is good also as composition of a homeotropic orientation, and] horizontally at the time of no voltage impressing At the time of voltage impression, it is good also as composition of the parallel orientation, i.e., level orientation, i.e., homogeneous orientation, that a liquid crystal molecule arranges perpendicularly to both substrates. Thus, it is possible to apply to various things as liquid crystal or an orientation method in this invention.
(The 7th operation form of liquid crystal equipment) Drawing 28 shows the principal part of the operation form of further others of the liquid crystal equipment concerning this invention. The liquid crystal equipment illustrated here is liquid crystal equipment of a passive matrix, and the structure shown in drawing 28 shows superficially, a part for an intersection, i.e., the display dot portion, of the electrode which counters mutually on both sides of liquid crystal.
[0177] In drawing 28 , it is prepared so that two or more common electrodes 11 may extend in the direction of X together with the direction of Y in the near side of a drawing. Moreover, it is prepared so that two or more segment electrodes 10 may be located in a line with the back side of a drawing in the direction of X and it may extend in the direction of Y. The segment electrode 10 is formed on the APC film 18 as a reflection nature electric conduction film by carrying out the laminating of the ITO film 19 as a metallic-oxide film. The ITO film 19 is covered with all the upper surfaces of the APC film 18, and sides. The edge portion 34 in which the APC film 18 does not exist among the ITO films 19 constitutes the light-transmission field which is made to penetrate light and is led to liquid crystal.
[0178] The overall structure of the liquid crystal equipment of this operation form of having the electrode structure shown in drawing 28 is the same as the liquid crystal equipment 1 shown in drawing 2 , and the common electrode 11 shown in drawing 28 and segment electrode 10 grade are arranged in the same part with the same quality of the material as the electrode shown with the same sign in drawing 2 .
[0179] The amount of [of the common electrode 11 and the segment electrode 10] intersection constitutes one display dot, and each one pigment layer 13r, 13g, and 13b of every in a light filter 13 (refer to drawing 2) is formed corresponding to this one display dot. At drawing 28 , "R" shows the red pigment layer and "B" shows "G" and the pigment layer of blue for the green pigment layer. Although the color array of the light filter in the case of drawing 28 is a stripe array, other arrays, for example, a delta array, a mosaic array, etc. are also employable if needed. It is thought that the display dot which is the smallest unit of a display is a field surrounded with the black mask 33 in drawing 2 . In the case of this operation form, this black mask 33 divides a rectangle-like display dot, as shown in drawing 29 , and the APC film 18 is arranged in the display dot. In drawing 29 , only the physical relationship of the APC film 18 and the black mask 33 is shown, and illustration of other optical elements is omitted.
[0180] As shown in drawing 29 , the APC film 18 is formed so that some fields in a display dot may be covered. Consequently, the field 17 in which the APC film 18 was formed corresponding to a part of display dot, i.e., a light reflex field, functions as fields for reflecting the light which carried out incidence from the upper substrate 3 (refer to drawing 2), and performing a reflected type display.
[0181] Fields other than fields other than light reflex field 17, i.e., the field covered with the APC film 18, i.e., the field equivalent to the edge portion 34 of the ITO film 19, function among display dots as the fields, i.e., the light-transmission field, for making the light which came out of the lighting system 25 (refer to drawing 2) as a back light, and carried out incidence to the lower substrate 2 penetrate, and performing a transparency display.
[0182] With this operation form, the configuration of the APC film 18 is selected so that the light reflex field 17 and the light-transmission field 34 may adjoin along with four each of side ** which demarcates the four sides which demarcate the field corresponding to a display dot, i.e., the opening field of the black mask 33.
[0183] For example, in drawing 29 , when it follows [by forming thickly in a longitudinal direction the width of face of the longitudinal direction of the APC film 18 in a display dot which is in a part for a center section mostly] toward the other end from the end of the side concerned about each of the four sides of a display dot, each field adjoins along the side concerned in order of the light-transmission field 34, the light reflex field 17, and the light-transmission field 34.
[0184] When are put in another way, and it approaches each side of a display dot and the straight line L parallel to the side concerned is assumed in the display dot concerned, the straight line L concerned passes through the both sides of the light reflex field 17 and the light-transmission field 34.
[0185] Furthermore, with this operation gestalt, the configuration of the APC film 18 is selected so that the length which met around there among the light reflex field 17 which adjoins along each side of a display dot, and the light-transmission field 34 may become almost equal. The length La1 of the light reflex field 17 which specifically met the side which extends in the direction of Y among display dots, and the length La2 (=La2'+La2'') of the light-transmission field 34 met the side concerned are almost equal.

[0186] As mentioned above, with this operation gestalt, since the light reflex field 17 and the light-transmission field 34 adjoin along the periphery of the display dot concerned in one display dot, it can prevent as follows that dispersion resulting from the

error on manufacture occurs about the rate of surface ratio of the light reflex field 17 and the light-transmission field 34 in the display dot concerned.
[0187] That is, as composition for preparing a light reflex field and a light-transmission field in one display dot, the composition shown in drawing 30 is also considered, for example. That is, while making the light-transmission field 34 into the field in alignment with two sides which extend in the direction of Y among display dots, it considers as the field into which the reflective field 17 was inserted by the light-transmission field 34 concerned. In addition, the field which should function as a display dot is shown by drawing 30 as a field 29 surrounded with the dashed line on the design.
[0188] That is, a field 29 is a field planned on the design as a field where the common electrode 11 and the segment electrode 10 (refer to drawing 2) should counter in within a substrate side. But it can be said that the common electrode 11, the APC film 18, and the segment electrode 10 do not interfere even if the common electrode 11 and the segment electrode 10 consider the field which actually counters to be a field 29, since it is obtained in a very high precision by technology, such as a photolithography and etching.
[0189] Here, its attention is paid to the process which sticks the lower substrate 2 of drawing 2 in which the APC film 18 was formed among the processes which manufacture liquid crystal equipment, and the upper substrate 3 in which the black mask 33 was formed. In this process, it is common to stick the substrates concerned, performing relative alignment of both substrates. when it assumes that the relative position in the direction of X of both substrates shifted for reasons of a manufacturing technology etc., for example at this time, as shown in drawing 30 (b), the light-transmission field 34 and the light-transmission field 34 of left-hand side [in / drawing 30 / more specifically] will be covered with the black mask 33 among the fields 29 which should function as a display dot
[0190] It becomes impossible therefore, for the light-transmission field 34 of the fields 29 which should originally function as a display dot to contribute to a display. That is, the area of the light-transmission field 34 occupied to a display dot becomes small as compared with the case where it is drawing 30 (a), when the black mask 33 has been arranged appropriately. On the other hand, even if it is the case where position gap of such a substrate arises, the light reflex field 17 is not covered with the black mask 33. That is, the area of the light reflex field 17 occupied to a display dot does not change with the case where it is shown in drawing 30 (a). Thus, in the composition shown in drawing 30 , change will arise in a luminosity by means of displaying as the area of the light reflex field 17 becomes dark as compared with the case where the luminosity of a penetrated type display is a reflected type display since it does not change, while it originates in the lamination error of a substrate and the area of the light-transmission field 34 decreases.
[0191] On the other hand, with this operation form, the light reflex field 17 and the light-transmission field 34 adjoin along with each of two or more sides which demarcates one display dot. therefore, the suitable position which the relative position of the upper substrate 3 (refer to drawing 2) and the lower substrate 2 shows to drawing 31 (a), i.e., the position on a design, -- since -- when it sees and shifts in the direction of X, as shown in drawing 31 (b), the area of the light reflex field 17 will also decrease with the area of the light-transmission field 34 That is, according to this operation form, even if it is the case where the relative position of the APC film 18 and the black mask 33 shifts, it can avoid that only the area of either the light-transmission field 34 or the light reflex field 17 decreases, and, so, can prevent that a difference arises for display grace between the reflected type displays with a penetrated type display.
[0192] Furthermore, with this operation gestalt, the length in alignment with the one side concerned in the light reflex field 17 which adjoins along with one side of a display dot, and the light-transmission field 34 is almost equal. For this reason, when the relative position of the APC film 18 and the black mask 33 shifts, area in which the light reflex fields 17 and the light-transmission fields 34 decrease in number can be made in general equal. Therefore, according to this operation gestalt, it can stop more certainly that a difference arises for display grace in a penetrated type display and a reflected type display.
[0193] (Octavus operation gestalt of liquid crystal equipment) Drawing 32 shows the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention. The liquid crystal equipment illustrated here is liquid crystal equipment of a passive matrix, and the structure shown in drawing 32 shows superficially a part for the intersection of the common electrode 11 and the segment electrode 10 which counter mutually on both sides of liquid crystal, i.e., a display dot portion.
[0194] Also in this operation gestalt, the ITO film 19 as a wrap metallic-oxide film is formed in latus width of face rather than the APC film 18 in the APC film 18 as a reflection nature electric conduction film, and the edge portion 34 of the ITO film 19 has covered all of the sides of the APC film 18. The edge section 34 of this operation gestalt is formed in the both sides of the APC film 18 as a rectangle region which extends in the direction portion of Y of the black mask 33, and parallel.
[0195] When using the liquid crystal equipment of this operation gestalt by penetrated type display, the edge section 34 of the ITO film 19 acts as a light transmission field which is made to penetrate light and is led to liquid crystal. In this operation gestalt, though the APC film 18 carries out a position gap to the black mask 33, if the position gap is less than the width-of-face size of the edge portion 34, the APC18 will not be in the black mask 33 with a heavy bird clapper in position. Therefore, even when a position gap occurs on the APC film 18, the big change between the area of a light reflex field and the area of a light-transmission field does not take place, and a big change does not produce it for display grace between the times of a reflective display and a transparency display.
[0196] Unlike the operation gestalt shown in drawing 29 , the opening 28 for light transmissions is formed in the internal field of the APC film 18 with this operation gestalt. If it carries out like this, a lot of light can be supplied to liquid crystal at the time of a transparency display. Therefore, when you wish a bright display at the time of a transparency display, it is desirable to form such opening 28.
[0197] (The 9th operation gestalt of liquid crystal equipment) Drawing 33 shows the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention. The liquid crystal equipment illustrated here is liquid crystal equipment of a passive matrix, and the structure shown in drawing 33 shows superficially a part for the intersection of the common electrode 11 and the segment electrode 10 which counter mutually on both sides of liquid crystal, i.e., a display dot portion.
[0198] Also in this operation gestalt, the ITO film 19 as a wrap metallic-oxide film is formed in latus width of face rather than the APC film 18 in both the direction of X, and the direction of Y in the APC film 18 as a reflection nature electric conduction film, and the edge portion 34 of the ITO film 19 has covered all of the sides of the APC film 18. In each display dot, the edge section 34 of this operation gestalt is the inside of the black mask 33, and is formed annular, the shape of i.e., a frame, to the field of the outside of the APC film 18.
[0199] When using the liquid crystal equipment of this operation gestalt by penetrated type display, the edge section 34 of the

ITO film 19 acts as a light-transmission field which is made to penetrate light and is led to liquid crystal. In this operation gestalt, though the APC film 18 carries out a position gap to the black mask 33, if the position gap is less than the width-of-face size of the edge portion 34, the APC18 will not be in the black mask 33 with a heavy bird clapper in position. Therefore, even when a position gap occurs to the both directions of the direction of X, and the direction of Y on the APC film 18, the big change between the area of a light reflex field and the area of a light-transmission field does not take place, and a big change does not produce it for display grace between the times of a reflective display and a transparency display.

[0200] (The 10th operation gestalt of liquid crystal equipment) Drawing 34 and drawing 35 expand and show the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention, especially one display dot portion. This whole liquid crystal equipment structure can be set up as shown in drawing 36. In addition, if the case where the three primary colors of R (red), G (green), and B (blue) perform a full color display is considered for example, the one above-mentioned display dot will be a dot corresponding to each of these 3 color, and one pixel will be formed when these three display dots gather. Moreover, considering the case where monochrome display is performed, the one above-mentioned display dot is equivalent to one pixel as it is.

[0201] The liquid crystal equipment concerning this operation gestalt is transflective reflection type liquid crystal equipment of an active matrix using TFT (Thin Film Transistor) which is a three terminal type active element as an active element, and is liquid crystal equipment of the COG (Chip On Glass) method of the method which mounts IC for a drive directly on a substrate.

[0202] In drawing 36, liquid crystal equipment 401 mounts ICs 404a and 404b for a drive in a liquid crystal panel 405, and is formed by attaching the back light 25 as a lighting system further. A back light 25 is attached to the outside of 1st substrate unit 402a of an opposite side an observation side.

[0203] In 1st substrate unit 402a and 2nd substrate unit 402b, in those peripheries, of the annular sealant 403, a liquid crystal panel 405 is further, formed lamination and by enclosing liquid crystal 456 in the gap between 1st substrate unit 402a and 2nd substrate unit 402b, i.e., a cell gap, as shown in drawing 34.

[0204] In drawing 36, the pixel electrode of the shape of two or more dot is formed in the internal field surrounded by the sealant 403 of 1st substrate 402a in a matrix-like array about a line writing direction XX and the direction YY of a train. Moreover, the field-like electrode of a non-pattern is formed in the internal field surrounded by the sealant 403 of 2nd substrate 402b, and the field-like electrode counters two or more pixel electrodes by the side of 1st substrate 402a, and is arranged.

[0205] The portion which sandwiched liquid crystal by one pixel electrode on 1st substrate 402a and the field-like electrode on 2nd substrate 402b forms one display dot, and a viewing area V is formed by arranging in the shape of a dot matrix in the internal field where the plurality of this display dot is surrounded by the sealant 403. By impressing a scanning signal and a data signal alternatively between the counterelectrodes which form two or more display dots, IC404a ** 404b for a drive controls the orientation of liquid crystal for every display dot. The light which passes this liquid crystal by orientation control of this liquid crystal is modulated, and images, such as a character and a number, are displayed in a viewing area V.

[0206] Drawing 34 expands and shows one cross-section structure in two or more display dots which constitute a viewing area V in liquid crystal equipment 401. Moreover, drawing 35 shows the planar structure of the display dot. In addition, drawing 34 shows the cross-section structure according to the I-I line in drawing 35.

[0207] In drawing 34, 1st substrate unit 402a has 1st substrate 406a formed of glass, plastics, etc. TFT as an active element which functions as a switching element on the front face by the side of the liquid crystal of this 1st substrate 406a (Thin Film Transistor407 is formed, an organic compound insulator 408 is formed on the TFT407, the pixel electrode 409 is formed on the organic compound insulator 408, and orientation film 411a is further formed on the pixel electrode 409.) Before sticking 1st substrate unit 402a and 2nd substrate unit 402b, rubbing processing as orientation processing is performed to orientation film 411a. The outside front face of 1st substrate 406a is equipped with polarizing plate 457a by attachment etc.

[0208] The pixel electrode 409 is formed of the laminated structure of the reflection nature electric conduction film 18 formed on the organic compound insulator 408, and the metallic-oxide film 19 by which the laminating was carried out on it. The reflection nature electric conduction film 18 is formed with the alloy which makes a principal component for example, a silver simple substance or silver, for example, an APC alloy. Moreover, the metallic-oxide film 19 is formed of ITO. Rather than the reflection nature electric conduction film 18, the metallic-oxide film 19 had latus area, and the edge portion 34 has jutted it out to the outside of the periphery edge of the reflection nature electric conduction film 18. This edge section 34 is formed along the whole region of the periphery edge of the reflection nature electric conduction film 18, as shown in drawing 35.

[0209] In drawing 34, 2nd substrate unit 402b which counters 1st substrate unit 402a has 2nd substrate 406b formed of glass, plastics, etc. A light filter 412 is formed in the liquid crystal side front face of this 2nd substrate 406b in the shape of a predetermined pattern, and the black mask 415 is formed in it so that between the light filter 412 may be filled. Furthermore, the transparent electrode 413 is formed on a light filter 12 and the black mask 415, and orientation film 411b is further formed on the electrode 413. An electrode 413 is a field electrode formed throughout the front face of 2nd substrate 406b of ITO (Indium Tin Oxide) etc. The outside front face of 2nd substrate 406b is equipped with polarizing plate 457b by attachment etc.

[0210] A light filter 412 is arranged in the shape of a matrix within a flat surface considering the coloring matter film of R (red), G (green), and B (blue) in three primary colors, or the coloring matter film of C (cyanogen), M (Magenta), and Y (yellow) in three primary colors as one unit, and the coloring matter film of each color is further put in order by a predetermined flat-surface array, for example, a stripe array, a delta array, and the mosaic array. Furthermore, if it puts one at a time in another way corresponding to each display dot, each coloring matter film in three primary colors will be formed so that each of the pixel electrode 409 by the side of 1st substrate 406a may be countered. The above-mentioned black mask 415 is formed corresponding to the field where the pixel electrode 409 does not exist.

[0211] In drawing 34, by the spherical spacer 414 with which it was distributed by the front face of one of substrates, the gap, i.e., the cell gap, between 1st substrate unit 402a and 2nd substrate unit 402b, a size is maintained and liquid crystal 456 is enclosed in the cell gap.

[0212] The gate electrode 416 by which TFT407 was formed on 1st substrate 406a, The gate insulator layer 417 formed throughout 1st substrate 406a on this gate electrode 416, The semiconductor layer 418 formed in the upper part position of the gate electrode 416 on both sides of this gate insulator layer 417, It has the source electrode 421 formed in one of the semiconductor layer 418 side through the contact electrode 419, and the drain electrode 422 further formed in the another side side of the semiconductor layer 418 through the contact electrode 419.

[0213] As shown in drawing 35, the gate electrode 416 is prolonged from the gate bus wiring 423. Moreover, the source electrode 421 is prolonged from the source bus wiring 424. The gate bus wiring 423 is prolonged in the longitudinal direction of 1st substrate 406a, and is formed in lengthwise two or more in parallel by regular intervals. Moreover, the source bus wiring 424 is

prolonged to lengthwise, and is formed in a longitudinal direction two or more in parallel by regular intervals so that the gate bus wiring 423 may be intersected on both sides of the gate insulator layer 417 (refer to drawing 34).
[0214] It connects with one side of ICs 404a and 404b for a drive of drawing 36, for example, the gate bus wiring 423 acts as the scanning line. On the other hand, it connects with another side of ICs 404a and 404b for a drive, for example, the source bus wiring 424 acts as a signal line. Moreover, as shown in drawing 35, the pixel electrode 409 is formed so that the field except the portion corresponding to TFT407 may be covered among the rectangular fields divided by the gate bus wiring 423 which crosses mutually, and the source bus wiring 424.
[0215] Here, the periphery edge of the metallic-oxide film 19 determined the periphery edge of the pixel electrode 409, and the edge portion 34 of the metallic oxide 19 has jutted it out over the outside of the reflection nature electric conduction film 18. Since it is buried with the black mask 415 on a design between the pixel electrodes 409 which adjoin each other mutually, the edge portion 34 is the inside of the black mask 415, and is arranged on the outside of the reflection nature electric conduction film 18. In drawing 34, when outgoing radiation of the light is carried out from a back light 25, the light penetrates the above-mentioned edge portion 34, and is supplied to liquid crystal 456.
[0216] The gate bus wiring 423 and the gate electrode 416 of drawing 35 are formed of chromium, a tantalum, etc. Moreover, the gate insulator layer 417 of drawing 34 is formed of a silicon nitride (SiNX), a silicon oxide (SiOX), etc. Moreover, the semiconductor layer 418 is formed of a-Si, polycrystal silicon, CdSe, etc. Moreover, the contact electrode 419 is formed of a-Si etc. Moreover, the source electrode 421, the source bus wiring 424 of it and one drawing 35, and the drain electrode 422 of drawing 34 are formed of titanium, molybdenum, aluminum, etc.
[0217] The organic compound insulator 408 shown in drawing 34 covers the gate bus wiring 423 of drawing 35, the source bus wiring 424, and TFT407, and is formed the whole region on 1st substrate 406a. However, a contact hole 426 is formed in the portion corresponding to the drain electrode 422 of an organic compound insulator 408, and the flow with the pixel electrode 409 and the drain electrode 422 of TFT407 is made in the place of this contact hole 426.
[0218] With this operation form, the light which reached the pixel electrode 409 concerned can be reflected with the reflection nature electric conduction film 18 concerned by including the reflection nature electric conduction film 18 in the pixel electrode 409. When there is un-arranging by specular reflection at this time, many detailed Yamabe and/or troughs can be formed in the front face of the reflection nature electric conduction film 18, and the moderate scattered light can be formed.
[0219] since the liquid crystal equipment 401 of this operation form is constituted as mentioned above, in performing a reflective display using an extraneous light, Arrow R shows drawing 34 -- as -- an observation side, the [i.e.,], -- liquid crystal 456 is passed, the reflection nature electric-conduction film 18 of the pixel electrode 409 is reached, it reflects by this electric-conduction film 18, and the extraneous light which went into the interior of liquid crystal equipment 401 from the 2 substrate unit 402b side is again supplied to liquid crystal 456 On the other hand, when performing a transparency display using the light by which outgoing radiation is carried out from a back light 25, as Arrow T shows, the light from a back light 25 penetrates the edge portion 34 of the metallic-oxide film 19 of 1st substrate 406a and the pixel electrode 409, and is supplied to liquid crystal 456.
[0220] The orientation is controlled by voltage impressed between the pixel electrodes 409 and counterelectrodes 413 as which liquid crystal 456 is chosen by a scanning signal and the data signal for every display dot. When the orientation of liquid crystal 456 is controlled by any [at the time of a reflective display and a transparency display] case, the light supplied to the liquid crystal 456 is modulated for every display dot by the liquid crystal 456 by which orientation control was carried out, and, thereby, images, such as a character and a number, are displayed on an observation side.
[0221] As mentioned above, with this operation gestalt, by the edge portion 34 prepared in the periphery section of the pixel electrode 409, the light-transmission field was formed and the transparency display was realized using this light-transmission field. Since this edge portion 34 was formed, even if it is the case where the reflection nature electric conduction film 18 of the pixel electrode 409 produces a position gap relatively to the black mask 415, if the position gap is less than the width-of-face size of the edge section 34, the reflection nature electric conduction film 18 will not hide in the black mask 415. Consequently, when it originates in the error at the time of sticking 1st substrate unit 402a and 2nd substrate unit 402b, and the error on other manufactures and position gap arises in the pixel electrode 409, it can suppress that change occurs for display grace between the reflective displays with a transparency display.
[0222] (Operation gestalt of electronic equipment) Next, an operation gestalt is mentioned and the electronic equipment constituted using the liquid crystal equipment mentioned above is explained.
[0223] Drawing 37 shows the mobile type personal computer which is 1 operation gestalt of the electronic equipment concerning this invention. The personal computer 1100 shown here consists of this soma 1104 equipped with the keyboard 1102, and a liquid crystal display unit 1106. This liquid crystal display unit 1106 can be constituted using the liquid crystal equipment 90 shown in drawing 11.
[0224] By the above composition, by computer 1100 of this operation gestalt, if there is outdoor daylight and outdoor daylight is inadequate as a reflected type, a display can be checked by looking as a penetrated type by making a back light turn on. Moreover, since the edge portion of the transparent metallic-oxide film located in the outside of a light reflex film was used as a light-transmission field, the display which suppresses change of display grace between a reflected type and a penetrated type, and does not have sense of incongruity can be performed.
[0225] Drawing 38 shows the portable telephone which are other operation gestalten of the electronic equipment concerning this invention. The portable telephone 1200 shown here has the liquid crystal display unit 1208 with the ear piece 1204 besides two or more operation buttons 1202, and a speaker 1206. This liquid crystal display unit 1208 can be constituted using the liquid crystal equipment 90 shown in drawing 11. Also in this portable telephone 1200, the display which suppresses change of display grace between the penetrated type displays with a reflected type display, and does not have sense of incongruity can be performed.
[0226] Drawing 39 is a digital still camera which is the operation gestalt of further others of the electronic equipment concerning this invention, and shows the thing using liquid crystal equipment as a finder. To exposing a film according to a photographic subject's light figure, a digital still camera 1300 carries out photo electric translation of a photographic subject's light figure by image pck-up element called CCD (Charge Coupled Device) etc., and the usual camera generates an image pck-up signal.
[0227] The liquid crystal display unit 1303 is formed in the tooth back of the case 1302 in a digital still camera 1300, and it has composition which displays based on the image pck-up signal by CCD. For this reason, the liquid crystal display unit 1303 functions as a finder which displays a photographic subject. The liquid crystal display unit 1303 can be constituted using the liquid crystal equipment 90 shown in drawing 11.
[0228] The light-receiving unit 1304 containing an optical lens, CCD, etc. is formed in the front-face side (setting to drawing rear-face side) of a case 1302. When a photography person checks the photographic subject image displayed on the liquid crystal

display unit 1303 and does the depression of the shutter release 1306, the image pck-up signal of CCD at the time is transmitted to the memory of the circuit board 1308, and is stored there. Moreover, if it is in this digital still camera 1300, the video signal output terminal 1312 and the input/output terminal 1314 for data communication are formed in the side of a case 1302. And as shown in drawing, a personal computer 1440 is connected to the input/output terminal 1314 for data communication for a television monitor 1430 again at the video signal output terminal 1312 if needed, respectively. Furthermore, the image pck-up signal stored in the memory of the circuit board 1308 has a television monitor 1430 and composition outputted to a personal computer 1440 by predetermined operation.

[0229] Drawing 40 shows the wrist watch type electronic equipment which is the operation gestalt of further others of the electronic equipment concerning this invention. The wrist watch type electronic equipment 1500 shown here has the liquid crystal display unit 1502 as a display supported by the main part 1504 of a clock, and can constitute this liquid crystal display unit 1502 using the liquid crystal equipment 90 shown in drawing 11. The liquid crystal display unit 1502 is controlled by the control circuit 1506 prepared in the interior of the main part 1504 of a clock, and displays time, a date, etc. as information.

[0230] In addition, as electronic equipment, the personal computer explained above, a portable telephone, a digital still camera, the device equipped with the liquid crystal television, the video tape recorder of a viewfinder type or a monitor direct viewing type, car navigation equipment, the pager, the electronic notebook, the calculator, the word processor, the workstation, the TV phone machine, POS-terminal machine, and touch panel other than wrist watch type electronic equipment, etc. are mentioned. And it cannot be overemphasized that can apply the liquid crystal equipment concerning this invention as a display of these various electronic equipment.

[0231]

[Effect of the Invention] When various kinds of errors arise according to this invention in case liquid crystal equipment is manufactured, as explained above, or when it can suppress that dispersion in the rate of surface ratio occurs between a light-transmission field and a light reflex field in a transflective reflective film and means of displaying changes in liquid crystal equipment by this, for display grace, it can prevent that dispersion occurs.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the plan showing 1 operation gestalt of the liquid crystal equipment concerning this invention.
[Drawing 2] It is the side cross section showing the cross-section structure of liquid crystal equipment according to the I-I line of drawing 1 .
[Drawing 3] It is the plan showing the planar structure of the principal part of the liquid crystal equipment of drawing 1 .
[Drawing 4] It is the plan showing other components in the same portion as drawing 3 .
[Drawing 5] It is the cross section showing the cross-section structure of the principal part of other operation gestalten of the liquid crystal equipment concerning this invention.
[Drawing 6] It is the cross section showing the cross-section structure of an example of conventional liquid crystal equipment.
[Drawing 7] It is the cross section showing the cross-section structure of other examples of conventional liquid crystal equipment.
[Drawing 8] It is the plan showing the principal part of the liquid crystal equipment which is consulted to this invention.
[Drawing 9] It is a cross section according to the III-III line in drawing 8 .
[Drawing 10] It is the perspective diagram showing the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 11] It is the cross section showing the cross-section structure of the principal part of the liquid crystal equipment shown in drawing 10 .
[Drawing 12] It is the plan showing the planar structure of the principal part of the liquid crystal equipment shown in drawing 10 .
[Drawing 13] It is the cross section showing the cross-section composition of other principal parts of the liquid crystal equipment shown in drawing 10 .
[Drawing 14] It is the plan showing the planar structure of other principal parts of the liquid crystal equipment shown in drawing 10 .
[Drawing 15] It is process drawing showing 1 operation gestalt of the manufacture method of the liquid crystal equipment shown in drawing 11 .
[Drawing 16] It is a graph for explaining the property of the reflection nature electric conduction film used with the liquid crystal equipment shown in drawing 10 .
[Drawing 17] It is the perspective diagram showing the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 18] It is the plan showing the planar structure of the important section of the liquid crystal equipment shown in drawing 17 .
[Drawing 19] It is the perspective diagram showing the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 20] It is the cross section showing the cross-section structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 21] It is the cross section showing the cross-section structure of other principal parts of the liquid crystal equipment shown in drawing 20 .
[Drawing 22] It is process drawing showing 1 operation gestalt of the manufacture method of the liquid crystal equipment shown in drawing 20 .
[Drawing 23] It is the plan showing the planar structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 24] It is a cross section according to the II-II line of drawing 23 .
[Drawing 25] It is process drawing showing an example of the manufacture method for manufacturing the element structure of drawing 24 .
[Drawing 26] It is process drawing which follows drawing 25 .
[Drawing 27] It is process drawing which follows drawing 26 .
[Drawing 28] It is the plan showing the planar structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 29] While a part of drawing 28 is expanded and shown, in drawing 28 , it is the plan showing other components which are not shown.
[Drawing 30] It is a plan for explaining the technology relevant to the technology shown in drawing 29 .
[Drawing 31] It is a plan for explaining the function of the technology shown in drawing 29 .
[Drawing 32] It is the plan showing the planar structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 33] It is the plan showing the planar structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 34] It is the cross section showing the cross-section structure of the principal part of the operation gestalt of further others of the liquid crystal equipment concerning this invention.
[Drawing 35] It is the plan of the structure shown in drawing 34 .
[Drawing 36] It is the perspective diagram showing the appearance of the whole liquid crystal equipment which has the cross-

section structure shown in drawing 34 .
[Drawing 37] It is the perspective diagram showing 1 operation gestalt of the electronic equipment concerning this invention.
[Drawing 38] It is the perspective diagram showing other operation gestalten of the electronic equipment concerning this invention.
[Drawing 39] It is the perspective diagram showing the operation gestalt of further others of the electronic equipment concerning this invention.
[Drawing 40] It is the perspective diagram showing the operation gestalt of further others of the electronic equipment concerning this invention.
[Description of Notations]
1 Liquid Crystal Equipment
2 Lower Substrate (1st Substrate)
3 Upper Substrate (2nd Substrate)
7 IC for Drive
8 Shading Layer
10 Segment Electrode
11 Common Electrode
13 Light Filter
14 15 Leading-about wiring
17 Light Reflex Field
18 APC Film (Reflection Nature Electric Conduction Film)
19 ITO Film (Metallic-Oxide Film)
23 Liquid Crystal
24 Leading-about Wiring
25 Back Light (Lighting System)
29 Display Dot
33 Black Mask
34 Edge Portion (Light-Transmission Field)
35 Ground Film
100 Liquid Crystal Panel
160 Liquid Crystal
190,290,390 Liquid crystal equipment
200 Front-Face Side Substrate (2nd Substrate)
300 Tooth-Back Side Substrate (1st Substrate)
202 Black Mask
204 Light Filter
205 Flattening Film
210 Common Electrode
303 Ground Film
310 Segment Electrode
312 Reflective Pattern (Reflection Nature Electric Conduction Film)
314 Transparent Electric Conduction Film (Metallic-Oxide Film)
320 TFD
330 Pixel Electrode
350,360,370 Wiring
352,362,372 Reflection nature electric conduction film
354,364,374 Transparent electric conduction film
401 Liquid Crystal Equipment
405 Liquid Crystal Panel
406a The 1st substrate
406b The 2nd substrate
407 TFT
409 Pixel Electrode
402 Light Filter
403 Electrode
405 Black Mask
456 Liquid Crystal
1100 Personal Computer (Electronic Equipment)
1200 Portable Telephone (Electronic Equipment)
1300 Digital Still Camera (Electronic Equipment)
1500 Wrist Watch Type Electronic Equipment (Electronic Equipment)
2100 Scanning Line
3100 Data Line
3320 Reflection Nature Electric Conduction Film
3340 Transparent Electric Conduction Film (Metallic-Oxide Film)
V Viewing area

[Translation done.]